PROPOSED LONDON AND PARIS RAILWAY

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PREFACE

Civilisation has now so far advanced that we may relegate as a thing of the past any surprise attack on a European country in a time of profound peace. Objections to a Channel Tunnel on these grounds can, therefore, be ruled out. In times of diplomatic tension it would be both natural and prudent, indeed essential, and withal not difficult, to take all necessary steps for the complete safeguarding of the English end of the Channel Tunnel.

This book has been written with a full sense of the responsibility which an appeal to the public for the requisite capital of approximately £200,000,000 involves. Not only must the Railway be an engineering success ; it must also be a financial success. For this, two things are necessary, traffic and cheap transportation.

As to traffic, it is certain that the quantity to be carried will be enormous. The population at the two terminal points of London and Paris has reached the huge figure of eleven millions. Moreover, the railways of Europe and Asia converge on Paris and Boulogne ;

the railways of the United Kingdom converge on London. The traffic link between these points will be the London and Paris Railway, and the density of traffic on this section will, in all probability, exceed that of any other railway in the world.

To obtain cheap transportation for a unique density of traffic, a unique system of transport is proposed, Brunel's broad gauge of 7 feet. A reference to p. 10 will show that the adoption of the broad gauge will reduce by more than 25 per cent. the dead weight for the whole of the very large passenger traffic to be conveyed on the Railway, much of which will be hauled at 120 miles per hour ; this radical departure from the usual practice, with a traffic of maximum density, will save the haulage of millions of tons of unnecessary dead load every year, and will result in a very large financial saving.

The average load of merchandise hauled in Great Britain in 1927 was 2·96 tons, weight of waggon about 7 tons, carrying capacity 10·28 tons. If the proposed Railway hauls standard-gauge waggons thus loaded from England to the Continent, the tare weight will be 236 (two hundred and thirty-six) per cent. of the paying load. If, on the other hand, broad-gauge waggons weighing 20 tons are loaded with 75 per cent. of their maximum load of 50 tons, the percentage of tare is reduced to 53 per cent., or, if fully loaded, to 40 per cent. In the first case, only 30 per cent. of the total load is hauled for payment ; 70 per cent. earns nothing at all. In the second example, 65 per cent. pays, and 35 per cent. is carried free ; and, in the third, 71 per cent. pays, and only 29 per cent. is free hauled. The

key to successful railway operation is a minimum dead-weight load.

The broad gauge will permit the employment of 1,500 horse-power motors as against a maximum of 750 horse-power on the standard gauge.

From its location, the Railway will carry a heavy traffic ; the broad gauge, by providing ample power and cheap transportation, will carry that traffic in a far more economical manner than the existing railways are able to do.

The capital sum required is very large, and in order to deserve and receive the confidence of the investing public, it is necessary to adopt every known means which modern engineering science can suggest to cheapen the cost of transportation, of which perhaps the most practical and important is the reduction of dead-weight load. Subject to the best possible service to the travelling public, the interests of the shareholders must be paramount. Every penny saved is a penny earned.

It is scarcely too much to say that the future prosperity of Europe, including both England and France, depends on a close, cordial, and above all, a far-seeing co-operation between Paris and London.

Lord Dufferin, H.M. Ambassador in Paris in 1893, said : " Half, or more than half, the misunderstandings which have come to exist between the English and other nations, especially our immediate neighbours, have arisen from want of knowledge of each other's modes of thought, temperament, forms of government and mental attitude. Any instrument which can modify

this ignorance will have a tendency to promote mutual sympathy, good-will and, to a certain extent, a community of interests. In proportion, therefore, as we can mitigate the horrors of a stormy passage across the Channel, whether as regards the discomfort of the passengers, or the expense and impediments to traffic, will the chances of promoting an amicable feeling between the two countries be increased."

These are weighty words. It is hoped that the plan for a direct Railway between London and Paris may be closely examined and found practicable by those qualified to judge, on both the engineering and financial aspects. With regard to the latter, high authorities concur in not anticipating difficulty in providing the capital required.

Owing to the necessarily technical nature of the chapters on "Gauge" and "High-speed Traction," the general reader might well be recommended to leave that section of the book to the last.

In conclusion, I desire to express my sincere and grateful thanks to the professional men who have collaborated with me in the production of this volume.

WILLIAM COLLARD.

20, SAVILE ROW,
LONDON, W.1.
1st October, 1928.

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APPENDICES

PROPOSED LONDON AND PARIS RAILWAY

THE greatest political need of our time is a better understanding with France, and nothing can contribute more effectually towards this end than improved communication between Great Britain and her nearest neighbour on the Continent. The genius and devotion of a long line of distinguished men, from Thomé de Gamond to Sir Francis Fox, have demonstrated the feasibility of building the Channel Tunnel ; others have designed and constructed a high-speed electric railway car which has attained a rate of speed of 130 miles an hour, and it is now proposed that a broad-gauge railway designed for the economical working of high-speed traffic, should be made to link London with Paris *per* submarine tunnel. It is hoped that with the goodwill of the British and French Governments, arrangements may be made for the customs examinations to take place at the terminal stations of London and Paris respectively, thus permitting a non-stop shuttle service to run between the two capitals in 2 hours 45 minutes, at an average speed of 92 miles per hour.

Details of Proposed Railway.—From the London terminus the Railway will rise at 1 in 750 for 21½

miles, passing Peckham, Lewisham, Sidcup, Farningham, Fawkham Green, and Ridley, and will then fall at 1 in 880 for 7½ miles through Trottiscliffe, Addington, and Leybourne. Three and a half miles of level will succeed, and will bring the line to Maidstone. From Maidstone, the Railway will climb at 1 in 1,000 up the Len valley, with stations at Bearsted, Leeds Castle, and Harrietsham, and at 1 in 1,120 through Chilston Tunnel, attaining an elevation of 210 feet at the eastern end. The next 13½ miles will be level, the line passing Chilston, Little Chart, Hothfield, Ashford, Willesborough, and Brabourne, and the Railway will then fall at 1 in 1,000 for 2 miles to Monk's Horton Station. At this point, falling 1 in 165, the Railway will enter the approach tunnel to the Channel Tunnel proper, the former will be nearly 11 miles in length. The actual length of the Channel Tunnel, H.W.M. to H.W.M., will be nearly 24 miles, and the exit tunnel on the French side (at a gradient of 1 in 185) 9 miles, making a total length of 44 miles. It will, however, be possible to commence the work of construction at five different points: the two entrances to the Tunnel, the shore on each side of the Channel, and the Elham Valley, and from the three intermediate shafts, headings in each direction would be driven. On emerging from the Tunnel, the Railway will rise at a gradient of 1 in 705 for 6¼ miles, passing near Ambleteuse; then at 1 in 1,000, passing Wimereux. A short level stretch will follow, and then a falling gradient of 1 in 883, passing through Boulogne. The next 18 miles will be level, and from Montreuil-sur-Mer the line will rise at 1 in 1,000 for 12½ miles. Three miles of level

will be succeeded by 8, rising 1 in 1,000, and the Railway will reach an altitude of 262 feet above sea-level. The next stage of 9 miles will be level, and the Railway will then fall at 1 in 1,000 for 3 miles, followed by 3 miles of level, and will then descend at 1 in 1,600 for 9 miles to Amiens.

On leaving Amiens, the gradient will rise at 1 in 1,000 for 27 miles, and the Railway will traverse the valley of the Noye, with stations at Ailly-sur-Noye, La Faloise, and Breteuil. After passing through the Noyers St. Martin Tunnel, the summit of the line will be reached 361 feet above sea-level at Montreuil-sur-Brêche. From this point, the Railway will fall at 1 in 750 for 9½ miles, and will be level for 5 miles, with stations at Hermes and Cauvigny. The line will then again fall at 1 in 1,000 for 9½ miles, to Persan, and crossing the River Oise, on a viaduct, at Beaumont-sur-Oise, will remain level for 7 miles. The next 10 miles from Maffliers to St. Denis, passing Ecouen, will be on a descending gradient of 1 in 750, followed by 4 miles of 1 in 800, which will bring the Railway to the entrance to the Paris terminus.

The average gradient both ways over the whole line will be 1 in 746; that of the English section, excluding the Channel Tunnel approach gradient, 1 in 1,215; the French section, excluding the Channel Tunnel approach gradient, 1 in 1,351, and that of the Channel Tunnel, including approaches at each end, 1 in 242. The Railway will be 253 miles in length.

It is proposed to lay down four lines from London to the entrance of the Channel Tunnel, of which two only will pass through the Tunnel, and in addition, two

extra lines for the suburban district, from London to Farningham. The inner pairs of rails will be principally devoted to the Continental traffic; the next to the English stations beyond Farningham, and the outer lines to the London suburban traffic. It is not thought that any economy would be secured by laying down a smaller number of lines to begin with, and attention is drawn to the sections dealing with suburban traffic working.

In France, it is similarly proposed to operate four lines from Paris to the entrance of the Channel Tunnel, and two additional lines from Paris to Beaumont-Persan for the suburban district. It might be held that as the suburban traffic is much less developed in Paris than in London, four lines would suffice, but, on the other hand, it will be remembered that the suburban traffic is growing, and is capable of great expansion; that the present facilities are very little in excess of demand, and that the suburban district to be served has great natural beauty. The limestone formations extend for 35 miles from Paris, and the total length of line to be operated from the Paris terminus is over 150 miles, more than double the length of the English Railway. It is, therefore, thought that it will be a wise and prudent policy, contributing to efficient and economical working, to lay down six pairs of rails from Paris to Beaumont-Persan.

Works.—To handle a heavy, high-speed traffic with safety and economy, necessitates easy gradients and wide radius curves. The gradients have been already indicated, and the curves have been planned to a minimum radius of 7 miles, excepting one at St. Denis, with a radius of 5 miles, one at the French entrance

to the Channel Tunnel, with a radius of 3 miles, and one at the entrance to the Paris terminus, with a radius of 1 mile. Electric motors have a gyroscopic action, and the wide radius adopted will not only contribute to the comfort of passengers, but will provide an ample margin of safety for the highest speeds at which it is proposed to travel, and even for those which the future may have in store for us.

Naturally, favourable gradients and curves can only be obtained with extensive and costly excavations, embankments, and engineering works, but all authorities agree that for heavy, high-speed traffic between populous centres, they are essential if operating costs are to be kept down. In such cases, undue economy of construction means greater liability to accident, extravagance in working, and, possibly, economy in gross receipts, none of which are to be desired, while as the Underground Railways have recently stated, "it is necessary to spend money in order to save money." When a railway is handling a small traffic, the operating expenses are small, and even if an economy of 50 per cent. could be effected, the actual amount would not be large, and would not justify a large increase in the capital expenditure. On the other hand, when a railway is carrying a traffic of high density, very large sums are spent in running expenses, and a saving of 20 or 25 per cent. in operating charges makes an important addition to the net revenue account. Economy in working expenses can only be attained by means of a relatively high capital expenditure.

The principal engineering works on the proposed Railway will be a viaduct in South London, and viaducts

over the Rivers Medway, at Maidstone (1,148 yards), Wimereux (518 yards), Liane (1,527 yards), Dordogne (440 yards), Canche (2,395 yards), Authie (1,698 yards), Nièvre (1,374 yards), Somme, at Amiens (3,060 yards), Thérain (1,202 yards), and Oise, at Beaumont-sur-Oise (3,248 yards).

The North Downs will be pierced by three tunnels, Farningham (1,505 yards), West Yoke (3,356 yards), Pettings (5,524 yards). These tunnels through the great chalk quadilateral massif to the north-west of Maidstone will, at Fawkham Green, Ridley, and Trottiscliffe, provide railway facilities connecting this elevated tableland with London in 30 minutes or less, and a considerable residential traffic may be anticipated. They will also supply an entirely new and direct route from London to Maidstone and the Channel Tunnel, the remainder of the journey having relatively favourable contours.

With the exception of a tunnel at Chilston (2,521 yards), no others will be required in England until Monks Horton Tunnel (10 miles, 1,606 yards), by which the Channel Tunnel will be approached. The latter will be 24 miles in length, and has been the subject of detailed study by Sir Douglas Fox and Partners, who say, in paragraph 35 of their report: "Summing up the engineering questions relating to the proposed Tunnel, we agree with M. Sartiaux and Mr. Brady in the opinion that the enterprise is one that can be carried out with certainty, and at comparatively moderate cost, the geological and other conditions being of an exceptionally favourable character for the construction of a submarine tunnel." The tunnels on the

French section of the Railway will be as follows :–Mont Couple, Channel Tunnel approach (8 miles, 1,592 yards), Boulogne (219 yards), Widehem (4,860 yards), Noyers St. Martin (3,443 yards), Cavillon (3,329 yards).

In accordance with the recommendation contained in the Report of Sir Douglas Fox and Partners, the Channel Tunnel and its approaches will consist of two separate single-line tunnels, one each for the up and down traffic respectively, but it is proposed to make the remaining tunnels, all of which, with the exception of Chilston, will also be constructed in the chalk, or gault, double-track tunnels. Both tracks in each tunnel will carry trains travelling in the same direction on the fast and slow lines respectively, which will assist ventilation. Two double-track tunnels are cheaper to construct than four single-track tunnels, and have the material advantage of not subjecting passengers in a high-speed train to the discomfort caused by a change of air pressure as experienced in the restricted dimensions of single-line tunnels. In the case of a submarine tunnel, however, with only one track in each direction, separate single-line tunnels are essential, both for ventilation and safety.

GAUGE

Railways to-day are in the position of paying wages largely in excess of those paid in pre-war days, and all commodities purchased are likewise dearer, while the general public, their customers, are poorer. They are bound, therefore, to study every possible channel of economy in working, in order to provide as cheap a service as practicable in present-day conditions, with a view to keeping fares and rates on the lowest remunerative basis, and thus earning a maximum revenue. The exact determination of the point up to which decreases of fares increase net revenue is a matter of great delicacy and difficulty, but there is no doubt that more would travel if passenger fares were lower. This desirable result can only be attained by reducing the cost of transportation. With wages, coal, and other expenses practically stabilised, further economies would appear difficult of realisation, but the London General Omnibus Company have indicated the lines on which the problem may be solved so far as the proposed Railway is concerned. Their "B" type of omnibus seated 34 passengers; this, "with the post-war level of costs, soon became too small a vehicle safely to enable a service to be worked at moderate fares for a profit." *

* Mr. Frank Pick, Assistant Managing Director L.G.O.C., *Modern Transport*, 25th March, 1922.

The company next introduced the "K" type, with 46 seats, and subsequently the "S" type with 54 seats. This type has a carrying capacity 59 per cent. higher than the "B" type, with the same labour cost per mile run; in other words, while paying the same wages, the labour operating cost has been reduced by 37 per cent. per seat provided. Similarly, the new vehicles weigh $4\frac{1}{2}$ tons as against $3\frac{1}{2}$ tons of the earlier type, but the dead weight per seat has fallen from 2·06 cwt. to 1·67 cwt., a reduction of 18·93 per cent., and it may be assumed that the power cost has been reduced in the same proportion.

The Metropolitan Carriage, Waggon, and Finance Company, Ltd., of Birmingham, have kindly prepared for this work drawings of a standard-gauge third-class corridor coach with lavatories, based on the latest practice, and a similar vehicle for a gauge of 7 feet. The former provides 19 inches of lateral seat space for 80 passengers, with a 2-feet corridor; the latter 20 inches of seat space for 132 passengers, with a corridor of 2 feet 2 inches. The weight of the standard-gauge coach is 34 tons 10 cwt.; per passenger, 8·6250 cwt. The estimated weight of the broad-gauge carriage is 40 tons 5 cwt., but the weight per passenger falls to 6·0985 cwt. on account of the larger number of passengers carried, and shows an economy of weight and haulage power required of 29·29 per cent. in favour of the broad gauge. Other types of vehicles show somewhat similar results, and all are summarised below:

Vehicle.	Gauge.	Compartments.	Seating capacity.	Weight.	Weight per passenger.
	ft. ins.			tons. cwt.	cwt.
First-Class Corridor with lavatories ...	4 8½	9	54	34 10	12·7778
Ditto	7 0	10	100	40 5	8·0500
Difference of weight per passenger					4·7278
Percentage difference of weight per passenger					37·00 %
Third-Class Corridor with lavatories ...	4 8½	10	80	34 10	8·6250
Ditto	7 0	11	132	40 5	6·0985
Difference of weight per passenger					2·5265
Percentage difference of weight per passenger					29·29 %
First-Class non-Corridor Suburban	4 8½	10	80	34 10	8·6250
Ditto	7 0	10	120	40 5	6·7083
Difference of weight per passenger					1·9167
Percentage difference of weight per passenger					22·22 %
Third-Class non-Corridor Suburban	4 8½	11	110	34 10	6·2727
Ditto	7 0	11	176	40 5	4·5739
Difference of weight per passenger					1·6988
Percentage difference of weight per passenger					27·08 %

With regard to goods traffic, it is practicable to build standard-gauge waggons weighing 17 tons, with a carrying capacity of 34 tons, or broad gauge, weighing 19 tons 17 cwt. with a capacity of 51 tons. On the standard gauge, under the most favourable conditions, the dead load per ton transported is 10 cwt., and on the

broad gauge, 7·7843 cwt., the latter showing a saving of 2·2157 cwt. per ton, or 22·15 per cent. in dead load. The standard-gauge vehicles in general use for the conveyance of goods traffic in this country are, however, of low capacity, and have an average load capacity of just over 10 tons for merchandise traffic and between 12 and 13 tons for mineral traffic, with a tare weight of about 7 tons and 8 tons respectively.

Definite information respecting the relative cost per unit of accommodation has not been obtained, but it is assumed that for passenger traffic it would show results approximating to the relative dead weight per passenger, and a difference in cost of seats provided of from 22 to 37 per cent., and for goods traffic a saving of 22·15 per cent. in favour of the broad gauge.

In a paper recently read before the Indian section of the Royal Society of Arts,* Mr. F. G. Royal-Dawson, M.Inst.C.E., compared the Indian broad gauge of 5 feet 6 inches with the metre gauge of 3 feet $3\frac{3}{8}$ inches, which is also largely used in that country, and expressed a strong opinion respecting the superiority of the broad gauge. He said: "It is an established fact, though not sufficiently recognised, that the working of the metre gauge is inherently less economical than that of the broad gauge; that is to say, for a given volume of traffic in a given tract of country, and under a given administration, the cost per ton-mile or per passenger-mile would be less on a broad-gauge railway than on an equivalent metre-gauge line."

The railway traffic of India is of much less density than that which will be handled between London and

* *Modern Transport*, 16th September, 1922.

Paris, and the observations quoted above, respecting the Indian gauges, will apply with even greater force to the advantages of the 7 foot broad gauge over the 4 foot 8½ inch standard gauge for working heavy traffic.

It will probably not be seriously questioned that the broad gauge offers very considerable advantages for the conveyance of heavy, high-speed traffic, but it is not economical on lines of medium or low earning power. As most of the railways in this country fall under the two latter headings, and as through services could not be instituted where a break of gauge existed, and the transfer of passengers and goods at an indefinite number of points caused endless trouble and expense, there cannot be the slightest doubt that the Great Western Railway Company took the only possible course in converting the broad-gauge sections of their railway—which extends from London in the south-east, through Birmingham to Birkenhead in the north-west; to numerous points in both North and South Wales; to Salisbury, Weymouth, Exeter, and Penzance in the south and west—to the standard gauge of the country.

It may well be asked, if the broad gauge has, after actual trial, proved a failure in this country, why should it be proposed for the Railway between London and Paris?

The answer is that the conditions existing are to a very large extent dissimilar. The Great Western may be likened to a tree, whose branches become smaller and smaller as they become more remote from the trunk, while, if a rather curious simile may be pardoned, the proposed Railway will resemble the bare and branchless

trunk portions only of two well-grown trees in a horizontal position, joined together base to base, with the boughs of the trees (which represent the existing railways radiating from London and Paris respectively) spreading away from each other. In the former case, only a portion of the system has a sufficient density of traffic to justify the broad gauge, and, as dual operation is impracticable, the broad gauge becomes impossible on a railway combining both high and low density lines.

On the other hand, with the possible exception of a line to the Kentish coalfields, the proposed Railway will have no branches, and is not likely to have any, as the districts through which it passes, in both England and France, are already adequately supplied with railway communication. It will connect the two most populous centres in Europe, in each of which are found numerous termini of important arterial railways, by which in one case the provinces and the principal ports handling American traffic are brought into easy communication with London, and in the other, not merely her own provinces, but a large part of the Continent is brought into touch with Paris, the metropolis of Europe.

It will, therefore, be evident that the whole, and not merely a part, of the proposed Railway will carry high density traffic, and is, therefore, suitable for the broad gauge.

Goods Traffic and the Broad Gauge.—The next objection that will be raised may be put as follows: "If consignments of goods, originating from points north of London, are destined to Paris or stations south

thereof, or *vice versâ*, will they not be tendered to the proposed Railway in standard-gauge vehicles, and such being the case, will not the transfer of goods involve great expense, and dislocation of traffic, reproducing the same annoyances and loss as that which led the Great Western Railway, many years ago, to discontinue the broad gauge ? ”

Practically the whole of the rolling stock in this country for the conveyance of merchandise traffic consists of four-wheeled waggons, having an average tare weight of 6–8 tons and a carrying capacity of 10–12 tons, but the operating statistics published by the Ministry of Transport show that the average load of merchandise carried is (1927) 2·96 tons.

It is reasonable to assume that trucks conveying traffic to London may be better loaded than the average, and we will, therefore, take an average load of 4 tons, but no management receiving a consignment of 100 trucks, with a tare weight of 700 tons and a paying load of 400 tons for a transit of 250 miles would send them on as received. At the lowest, they would tranship from some of the trucks into others in order to send forward only completely loaded vehicles. This is, of course, regularly done in the United States at transhipment stations, where Less-than-Car-Load-Lots are made into Car-Load-Lots.

The unit cost of transhipment varies inversely as the quantity to be handled ; when this is large, the installation of expensive machinery is justified, and produces economical results.

The merchandise traffic passing through the Channel Tunnel would undoubtedly be large enough to permit,

economically, entire transhipment into high-capacity waggons, and if this is conceded, it matters not whether the waggons are of standard gauge or broad gauge, except in so far as the latter has a lower proportion of tare to paying load. Taking the figures quoted above, a dead load of 7 tons to an average paying load of 4 tons standard gauge, represents a proportion of 175 per cent. for tare, while in a fully loaded high-capacity broad-gauge vehicle the proportion falls to 39 per cent. This is important on account of the length of the haul, which, making allowance for transhipments at Boulogne and Amiens, would average nearly 200 miles, and also on account of the adverse gradients of 1 in 165 and 1 in 185 encountered after passing through the Channel Tunnel in either direction.

It may further be stated that in view of the commercial importance of both London and Paris, a large amount of traffic originating in one of these cities will be consigned to the other, and in this case no break of gauge will occur, the only thing that matters being efficient and economical transportation.

All consignments of goods from abroad will have to be inspected, presumably in London, by the English Customs authorities, and in the majority of cases the railway waggons would have to be unloaded for this purpose. The goods, if intended for destinations in the interior of England, could be repacked after examination into standard-gauge waggons belonging to the existing English railways, one transhipment thus serving both purposes. Goods forwarded from England to France would also pass the Customs at the point where their broad-gauge journey terminated, either at

Boulogne or Paris, thus obviating a supplementary transhipment on account of the change of gauge.

Even if the proposed Railway were constructed on the 4 foot 8½ inch gauge, it is extremely doubtful if the English northern railways would permit their rolling stock to operate on the Continent of Europe, in view of the delays inseparable from its return, and the necessity for capital outlay to keep the home stock at its former figure. The difficulties of some of the American railways in this respect are well known. This would necessitate transhipment in London.

If the broad gauge is adopted for the proposed Railway, its rolling stock will operate merely between London and Paris, a distance of 253 miles, but should it be built on the standard gauge, it would be difficult, if not impossible, to resist the demand for through loading ; its vehicles would be found in every railway centre in Great Britain and the Continent, and the capital outlay for rolling stock would be increased tenfold.

The four-wheeled vehicles in general use in this country for merchandise traffic are not suitable for high speeds, and are rarely worked in excess of 40–45 miles per hour. By the proposed route, the Channel Tunnel and its approaches will have a combined length of about 44 miles, with an adverse gradient of 1 in 165 for 11 miles in one direction and 1 in 185 for 11¾ miles in the other, the exit gradient in the latter case commencing in the Channel Tunnel proper. In these conditions, it is not thought that slack-coupled trains of such vehicles, starting from rest in a siding, could pass through the Tunnel in less than 60–70 minutes.

At first, and probably for many years to come, there will only be a single track in each direction through the Tunnel. A five minutes' interval would be necessary after a passenger train entered the Tunnel before a waiting goods train, stationary in a siding park, would be able to follow, and a minimum headway of 40 minutes would be required between a goods train of this character and the following passenger train, which would pass through the Tunnel in about 39 minutes, assuming a timetable margin of 10 minutes between the goods and passenger trains at the exit of the Tunnel. It would, therefore, be possible to work one ordinary goods train through the Channel Tunnel whenever a timetable interval of not less than 45 minutes is provided between two passenger trains.

Owing to the extraordinary length of the Tunnel, the inspection and renewal of the permanent way will present exceptional difficulties. Permanent-way men and gangers will have to be dropped at points by a special car, and picked up by another, when they have done their work. On account of the heavy traffic and comparatively short intervals between the passenger trains, this will be impracticable during the daytime, and it will probably be found necessary to entirely close the Tunnel for a period of four hours nightly, in order that the examination and maintenance of the track may be rigidly and effectively carried out.

Incidentally, the permanent way on this section of 44 miles will not be liable to weather deterioration, and the variation of temperature will be less than usual, thus permitting a smaller expansion allowance between one rail and the next than is required in the open, which

would contribute to comfort in travelling and lessened wear for the rolling stock.

The first train from London will enter the Tunnel at 5.50 a.m., and there will be one other train before 7.45 a.m. From this time until 9.5 p.m., 32 south-bound passenger trains will pass through the Tunnel on the ordinary timetable, and during this portion of the day there will only be four intervals of 45 minutes between passenger trains, and none of longer duration. After 9.5 p.m., there will be three more passenger trains, the last entering the Tunnel at 0.35 midnight. In these conditions the number of normal standard-gauge goods trains that could be worked through the Tunnel in the day of 20 hours would be very limited, and would, it is thought, be insufficient to carry the traffic.

If, however, special goods rolling stock were built to work safely through the Tunnel at the same speed as the passenger stock, *i.e.* with an average non-stop running speed of 67 m.p.h., or from a dead start to flying finish at an average of 59 m.p.h., with a maximum speed not exceeding 90 m.p.h., we shall be able to work a goods train through the Tunnel whenever we have a 20-minute interval between passenger trains, two in 30 minutes, and three in 40 minutes. Double heading would be provided for this section in order to maintain the required speed on the long gradients of approximately 11 miles each leading out of the Tunnel, without reducing the weight of the trains, or an alternative scheme would be to double-track the exit tunnels, the widening to begin as soon as the submarine portion was passed. On the remainder of the journey, the goods

trains would travel on the slow lines at the speed found to be most economical, probably about 40 miles per hour.

It is, therefore, of great importance that the goods rolling stock should be capable of travelling safely through the Tunnel at higher speeds than can be permitted to the ordinary four-wheeled standard-gauge waggons of to-day, and if specially constructed to run at the same speeds as the passenger rolling stock for the submarine portion of the journey, it will be possible to convey a maximum volume of traffic, both passengers and goods, through the Tunnel. This special rolling stock could, of course, be constructed on the standard gauge as on the broad gauge, but either would necessitate transhipment.

A further point is that four-wheeled merchandise and mineral trucks are more liable to failure than ordinary passenger stock. A derailment in the restricted dimensions of a single-track tunnel of the altogether unprecedented length of 44 miles would be a serious matter, involving several hours' delay to the traffic, and as a precautionary measure it would be wise to forbid the use of the Tunnel to this class of traffic, which it will be remembered is not usually fitted with continuous brakes.

From whatever point of view it is regarded, transhipment of goods, to obtain better loading, more economical haulage, or more effective use of the Tunnel, is inevitable. If the transhipment is effected into broad-gauge vehicles, we have increased economy of transit, a lower capital cost per unit of accommodation provided, and an infinitely smaller capital outlay for rolling stock.

Passenger Traffic and the Broad Gauge.—London and Paris are not only the most populous cities in Europe, but their populations contain a larger proportion of those classes who provide the bulk of the receipts from long-distance travel than is found elsewhere.

In addition, there are very few English people of these classes living outside London who have not social or business relations with the metropolis, and who do not spend at least some days in it every year.

It is, therefore, thought that a large part of the passenger traffic from England to the Continent would originate in London, not merely from those who normally reside there, but also from those from other parts of the United Kingdom, who customarily visit London for business or pleasure, and would subsequently proceed to the Continent.

To all continental passengers commencing their journey in London, whether residing there either permanently or temporarily, a break of gauge in London would be a matter of indifference, and it is felt that these would constitute a very large proportion of the total traffic.

Further, all passengers entering England, or entering or leaving France, with the whole of their belongings, have to undergo examination by the Customs. In the case of the Paris and Brussels international non-stop expresses, hand luggage is inspected in the train ; other luggage on arrival at Paris and Brussels respectively ; with the London and Paris air services, all luggage is examined at the terminal stations, and it is hoped that arrangements of a similar character may be made for

the proposed Railway in order to avoid an intermediate stop. The Customs examination will entail the complete evacuation of the train for passengers, luggage, and goods (luggage and goods registered to the frontier alone excepted). Where this takes place, a break of gauge becomes of none effect; passengers can with equal facility return to the train by which they have travelled, or enter another.

Two or three years ago, there were some rather serious complaints of the inadequacy of the accommodation provided on the cross-Channel services during the holiday months of August and September. The difficulties are principally caused by the fact that the traffic is very far from being uniform throughout the year, nor is it evenly distributed over the hours of the day. It would probably be within the mark to estimate that a service in the holiday months may have to carry, as a maximum, three or four times the average number of passengers who travel by it throughout the year, and this maximum may be thirty times as great as the number of passengers in a minimum winter load. It is, therefore, essential that a railway should have a considerable reserve of carrying power above the average demand, in order to enable it to cope with holiday traffic.

Elsewhere, in this book, it is estimated that the proposed Railway will annually carry 12½ million passengers (counting both ways) through the Channel Tunnel. Assuming that there are 350 effective working days in the year, this is an average of 17,857 passengers each way per day. If these passengers are evenly spread over a 13 hours' day, they would require one broad-gauge train, seating 550 passengers, every 24

minutes. The summer holiday traffic might easily reach at certain hours on certain days a maximum density of three times this figure, which would necessitate a broad-gauge train every 8 minutes.

All authorities agree that exceptional precautions should be taken for working traffic through the Channel Tunnel, and Lord Lansdowne's Draft Report (prepared in 1883) recommended that not more than one train at a time should be allowed on the severe gradients giving access to, or egress from, the Tunnel. Railway equipment has made great strides in the forty-five years that have elapsed since this Report was penned; the maximum gradients now proposed are considerably easier, and the suggestion may, perhaps, err on the side of over-caution; but in this connection it may be mentioned that the two inclines leading out of the Channel Tunnel on the proposed Railway will be about 11 miles in length, and will be traversed in 8 minutes by the electric trains passing through the Tunnel. Consequently, a service of three times the average density, carried on the broad gauge, would comply with the conditions laid down in Lord Lansdowne's Report.

If, however, the proposed Railway were constructed on the standard gauge, it would be necessary to provide nearly double the number of trains to accommodate the traffic, and this would entail either:—

(*a*) running trains during the peak period with a less interval than 8 minutes between them;

(*b*) constructing a duplicate tunnel at heavy expense, which would only be occasionally needed; or,

(*c*) inadequate accommodation for the public at

holiday times, which would injuriously affect the reputation of the Railway.

One broad-gauge tunnel for each direction, by reason of its greater carrying power, will efficiently handle the holiday traffic on the proposed Railway, which in all probability at certain seasons in the year, would exceed the capacity of corresponding tunnels on the standard gauge.

For suburban services, where corridor coaches are not used, the broad gauge will give a 50 per cent. first-class and 60 per cent. third-class increase in carrying capacity in trains of a given length, with no increase in labour operating charges, and an increase of only 16·7 per cent. in the dead load. The dead weight per unit of accommodation provided, which is followed very closely by the power consumption, shows a reduction of 22·22 per cent. for first-class, 27·08 per cent. for third-class, and labour of 33·3 per cent. and 37·5 per cent. respectively.

Wind Pressure.—As will be seen later, frontal wind pressure is a factor of very great importance in high-speed running, and on the basis of 19 inches of seat space per passenger, a 24-inch corridor and 4-inch sides to the coach, a third-class standard-gauge coach will seat four passengers a side with an overall width of 9 feet, an average of 27 inches per passenger. Under the same conditions, the broad gauge will seat six passengers a side, with an overall width of 12 feet 2 inches, an average of 24·3 inches per passenger, showing a difference of 2·6 inches per passenger in favour of the broad gauge, being 9·88, or, approximately,

10 per cent. It is intended to build the rolling stock on the proposed Railway to a maximum overall width of 12 feet 10 inches, but as increased lateral accommodation per passenger will be provided, the comparison given above is not affected.

A broad-gauge train with a given seating accommodation will be only about two-thirds of the length of a standard-gauge train of equal seating capacity; the broad gauge will therefore show considerable economies over the standard gauge per passenger carried, both as regards frontal wind pressure, and air resistance on roof, sides, and bogies.

With regard to high-speed traffic between populous centres, a further advantage of the broad gauge is that as the space between the rails, and, consequently, the width at the driving axles is increased by approximately 50 per cent., and the bearings and other gear are not sensibly affected, practically the whole of the increased lateral space thus gained can be devoted to the accommodation of the motors, and as the loading gauge on the proposed Railway will not be limited by pre-existing tunnels or bridges, the vertical dimensions of the motors can also be increased; consequently no difficulty will arise in providing motors of at least twice the maximum power possible on ordinary standard-gauge rolling stock. The power available for traction is materially augmented on the broad gauge, while the dead weight per unit of accommodation provided shows a marked diminution, thus greatly increasing the ratio of power to weight, thereby permitting a higher speed, a shorter transit time for the journey, and, consequently, a larger traffic.

The broad gauge of India was adopted partly on account of its greater stability in tropical storms, and it will be a safety factor on the proposed Railway where it crosses lofty and exposed viaducts. It would also seem not inappropriate that an increase of normal maximum speed from say 80 miles per hour to 120 should be accompanied by a proportionate increase in vehicle base width, and this should certainly contribute to steady running at high speed.

For passenger traffic, the broad gauge offers a marked reduction in the dead-weight load, necessarily hauled at high speeds ; a considerable diminution per unit of traffic in both frontal and lateral wind pressure ; one Channel Tunnel constructed on the broad gauge will nearly do the work of two standard-gauge tunnels ; the broad gauge provides a wider space between the rails, thus giving greater stability and increased room for machinery ; by augmenting the passenger accommodation in trains of a given length it reduces the labour operating cost per passenger carried. All these advantages will be obtained without change of vehicle other than that normally required for Customs formalities.

Cost of Broad Gauge.—We must now inquire, with some care, what the extra cost of a broad-gauge railway would be, in order to ascertain if the savings in operating costs would justify the extra outlay.

Land.—It is not considered that the cost of land for a broad-gauge railway would exceed that for a standard-gauge railway, provided a heavy traffic is to be handled, as the carrying capacity of the broad gauge is from 50 to 85 per cent. greater (according to the class of vehicle

used); the gauge 49 per cent. greater, and the formation width only 25 per cent. greater. The quantity of land required being based on potential traffic-carrying capacity, two broad-gauge lines in each direction will easily do the work of three standard-gauge lines, and in fact the land required per 100,000 passengers, with reserve for developments, is actually less on the broad gauge than on the standard gauge.

Earthworks.—The difference of width between the broad and the standard gauges is 2 feet 3½ inches, to which must be added the greater overhang of the broad gauge vehicle of 1 foot 6½ inches, giving a total of 3 feet 10 inches per track; 15 feet 4 inches for four tracks, and 23 feet for six tracks. The average depth of cuttings on the English six-track section is 38 feet; they extend for 16,730 yards; the average depth of cuttings on the four-track section is 45 feet, with a distance of 25,965 yards. The extra excavation due to the broad gauge, with a 20 per cent. allowance for error, amounts to 1,947,372 and 2,399,166 cubic yards respectively. Extra cuttings for sidings are estimated at 841,116 cubic yards, making a total of 5,187,654 cubic yards attributable to the broad gauge, which, at 2*s.* 2*d.* per cubic yard, represents a money value of £561,996, or 9·2 per cent. of the outlay.

Calculated in the same way, the extra cuttings on the French section of the line due to the broad gauge amount to 20,467,625 cubic yards, costing £2,217,326, or 9·2 per cent. of the total.

The excavation required for the slopes of the cuttings is the same for either broad or standard gauge, as is also the space beside and between the tracks,

save only for a slight addition due to increased overhang; the 50 per cent. increase in gauge, and even greater increase in carrying capacity are, therefore, gained at a markedly lower percentage increase in excavation costs.

Bridges and Viaducts.—The extra width of bridges and viaducts, due to the broad gauge, is 15·75 per cent. for six-track sections and 14·75 per cent. for four-track sections. The six-track viaduct in South London is estimated to cost £3,588,085, of which £565,124 is due to the broad gauge, and the four-track viaduct at Maidstone will cost £625,660, of which the broad gauge will be responsible for £92,285.

There will be several four-track viaducts in France, with a total cost of £10,177,950, of which £1,501,248 is attributable to the broad gauge. The total excess for England and France is estimated at £2,158,657.

The six-track viaduct in South London will be situated at a point where great density of traffic will be experienced at certain hours of the day. In the following table, the viaduct cost for each pair of standard-gauge lines, one up and one down, is taken as 85, as is also their carrying capacity, and it will be seen that a viaduct for six broad-gauge lines, costing 300, has practically the same carrying capacity as one carrying ten standard-gauge lines costing 425, thus showing a striking economy not only in working expenses, where it may be expected, but in actual capital cost, where it would perhaps hardly be looked for.

Standard Gauge.			Broad Gauge.	
No. of lines.	Cost.	Carrying capacity.	Cost.	Carrying capacity.
2	85	85	100	140
4	170	170	200	280
6	255	255	300	420
8	340	340		
10	425	425		

It should, perhaps, be explained that the reason why a 50 per cent. increase in gauge does not involve a 50 per cent. increase in viaduct cost is that the greater part of the width of a railway is occupied by spaces separating the tracks and on the outside of them. Thus, on an ordinary standard-gauge double line, the formation width is 30 feet, and the space between rails 4 feet $8\frac{1}{2}$ inches$\times 2 = 9$ feet 5 inches. It is only this latter which is increased by 50 per cent., plus a small allowance of 1 foot $6\frac{1}{2}$ inches per track for increased overhang, and, therefore, the formation width for a double-track broad-gauge line would be only 37 feet 8 inches, as against a standard-gauge width of 30 feet.

The difference of 7 feet 8 inches represents an increased width of 25·5 per cent. on the standard gauge, but, calculated inversely, a reduction of only 20·4 per cent. on the broad gauge. Trains will run on the proposed Railway at very high speeds, and in order to safeguard the men working on the line, it will be necessary to allow a wider space between each track than has hitherto been customary, whether the line is

standard gauge or broad gauge, and with this increase of the fixed factor the percentage of the variable to the whole is reduced to about 15 per cent.

Tunnels.—It is estimated that the increased cost of tunnels due to the broad gauge, is about 31·48 per cent. of the total. This is based on the difference between the sectional area of a tunnel 18 feet in diameter, and one 22 feet in diameter. The cost of tunnels in England and France will be £6,752,700 and £5,906,100 respectively, and the Channel Tunnel £24,000,000, the whole amounting to £36,658,800, of which 31·48 per cent. equals £11,540,190.

Permanent Way and Sidings.—As in the case of bridges and viaducts, it is considered that the additional outlay for the broad gauge will represent about 15 per cent. of the total. This is estimated as £6,040,000 for England, £13,720,000 for France, and £960,000 for the Channel Tunnel, a total of £20,720,000, of which 15 per cent. amounts to £3,108,000.

Rolling Stock.—In view of the greater accommodation provided by a vehicle of a given length, the cost per seat for passenger traffic and per cubic foot for goods traffic will not be higher on the broad gauge than they are on the standard gauge; they will in all probability be less. No allowance has, therefore, been made for increased capital charges under this head.

The extra cost of constructing the proposed Railway on the broad gauge appears to be £19,586,169, to which must be added interest on capital during construction, calculated at 5 per cent. per annum for four years, £3,917,234, making a total difference of £23,503,403,

or 12·42 per cent. on the estimated capital outlay of £189,177,094.

Economies of the Broad Gauge.—The economies in operating costs effected by the broad gauge are attributable to the lower dead weight per passenger and per ton of goods transported ; also to the lower labour cost per unit of traffic, consequent on the higher carrying capacity of trains of given length.

They are greater for passenger traffic than for goods traffic, and the importance of the saving increases with the speed and also with the density of the traffic. They are higher with corridor passenger stock than with non-corridor, but lower in high-capacity waggons for goods and mineral traffic, as in these the tare load, on which alone the saving is made, bears a lower proportion to the total load than in low-capacity vehicles.

Speaking generally, it is believed that the broad gauge will show an economy in dead-load passenger haulage of from 22 to 37 per cent. Let us take the average as that shown for a third-class corridor passenger coach, say 29·29 per cent. It is thought that the dead load for passenger-train traffic amounts to about 80 per cent. of the total ; therefore, an economy of 29·29 per cent. in the dead load would amount to a saving of 23·43 per cent. on the total load.

In dealing with goods traffic, we must take the most improved type of waggon which can be constructed on the standard gauge, and not the ordinary 10-ton capacity waggon in general use, as the basis of comparison with what can be done on the broad gauge. We, therefore, take a standard-gauge waggon weighing 17 tons, with a

carrying capacity of 34 tons, that is to say, with 10 cwt. of tare for every ton carried.* A corresponding broad-gauge waggon will weigh 19 tons 17 cwt., and carry a load of 51 tons, the dead load being reduced from 10 cwt. to 7·785 cwt. for every ton of paying load. The saving in dead load per ton carried is, therefore, 2·215 cwt., or 22·15 per cent., but only 7·38 per cent. on the total of live and dead load together.

In this calculation, it has been assumed that both the standard-gauge and broad-gauge waggons have been fully loaded. This is the ideal to be aimed at, but, of course, it is manifestly impossible that all waggons should at all times be loaded to their maximum capacity. If we take an average of 75 per cent., this would be a considerable improvement on existing practice, and would probably be as high as could ever be realised in actual working conditions over a period. The economy in dead load would, of course, be the same as for fully loaded waggons, 22·15 per cent., but the saving on live and dead load combined rises from 7·38 per cent. for fully loaded waggons to 8·86 per cent. for waggons loaded to 75 per cent. of capacity, which it is thought is the maximum average loading attainable in practice.

For both passenger and goods traffic, labour operating cost shows a diminution on the broad gauge, which is estimated at 46·0 per cent. for first-class corridor stock; 39·4 per cent. for third-class corridor stock; 33·3 per cent. for first-class non-corridor

* With waggons for mineral traffic we could get a rather lower percentage; for merchandise traffic, not quite so good; this figure is given as an average.

(suburban) traffic; 37·5 per cent. for third-class non-corridor traffic, an average of 39 per cent. for passenger traffic, and 33·3 per cent. for goods traffic. These figures are based on the increased lateral accommodation provided by the broad gauge on trains of a given length.

Maintenance and Renewal of Way and Works.—The passenger traffic on the proposed railway is expected to earn rather more than twice as much as the goods traffic; there will consequently be at least double as many trains, and these trains will travel at double the speed of the goods trains. The estimated saving in gross weight for passenger accommodation, 23·43 per cent., has been, therefore, multiplied by four, adding in the goods-train economy of 8·86 per cent., and the figure thus obtained has been divided by five, giving an average percentage for the whole of 20·51. This has been reduced by one-third, on the assumption that one-third of repairs is due to weather and natural decay, and two-thirds to traffic,* and shows a net saving under this head of 13·68 per cent., with a money value of £535,913.

Maintenance and Renewal of Rolling Stock.—It is thought that the cost of broad-gauge rolling stock per unit of accommodation provided will show a reduction as compared with the standard gauge, following very closely the estimated reduction in dead weight, and it is expected that the outlay for maintenance and renewal of rolling stock will show a corresponding reduction. We, therefore, take the figure of 29·29 per cent. for

* Proportion given by Sir William Acworth, *The Elements of Railway Economics*, p. 34.

passenger stock as quoted in a preceding paragraph, multiply it by four, on account of the passenger trains being more numerous and rapid than the goods trains; add in the estimated economy for goods rolling stock of 22·15 per cent., and divide by five, giving an average percentage of 27·86. This, on an estimated standard-gauge expenditure of £5,499,103, would show an economy of £1,532,050.

Electric Power and Running Expenses.—Here we are concerned with economy in gross load, and also with the lower wages cost per unit transported. For passenger haulage, we take the figure of 23·43 per cent. previously given, multiplying it by four, on account of greater quantity and higher speed, and add 8·86 per cent. for goods traffic. The economy in labour cost has been estimated as ranging from 33·3 per cent. to 46 per cent. for passenger traffic, and 33·3 per cent. for goods traffic. It is proposed to take an average of 39 per cent. for passenger traffic, which is multiplied by two on account of its greater volume, and 33·3 per cent. is added for goods traffic. The total is then divided by eight, which gives an average percentage saving of 26·74 per cent., and shows an economy of £2,104,366 on the estimated figure for the standard gauge.

Traffic Expenses.—It is thought there will be a further small saving in guards' wages, owing to the higher carrying and earning capacity of both passenger and goods trains of a given length on the broad gauge, and this is estimated at 12½ per cent. of guards' wages, or, say, 1 per cent. of traffic expenses on the standard gauge, and amounts to £78,546.

The estimated annual savings from the adoption of the broad gauge are summarised below:

	£
Maintenance and renewal of way and works ...	535,913
Maintenance and renewal of rolling stock	1,532,050
Electric power and running expenses	2,104,366
Traffic expenses	78,546
	£4.250,875

The additional capital outlay due to the broad gauge is estimated at £23,503,403, on which the estimated annual savings show a return of 18·09 per cent. They reduce the estimated ratio of working expenses to gross receipts from 78·09 per cent. to 66·00 per cent.

With passenger trains travelling at a maximum speed of 120 miles per hour, the current consumption must necessarily be heavy, and it becomes of considerable importance to reduce the dead weight hauled to an absolute minimum.

The broad gauge shows the way to real economies in working expenditure, and owing to the necessity for Customs examination, the break of gauge at London, Paris, and Boulogne will cause no additional inconvenience to passengers. All points in Kent through which the proposed Railway will run have through standard-gauge communication to London; similar conditions prevail on the French section of the Railway with regard to Paris; consequently there will be little or no transfer of traffic from one gauge to the other, except at the Customs stations mentioned above, where exceptional facilities for handling will be installed.

On account of the international character of the proposed Railway, it is thought that the undoubted

advantages of the broad gauge for the economical working of heavy high-speed traffic can be secured without any drawbacks whatever, and it is strongly recommended that the proposed Railway be constructed on the broad gauge of 7 feet.

HIGH-SPEED TRACTION

In approaching the examination of the haulage problems involved in a high-speed broad-gauge railway, it must be recognised that a new field of engineering is entered upon. While speeds of 105 miles per hour have been obtained on normal-gauge railways in America with electric locomotives, and 130 miles per hour on the Zossen trials by a high-speed car, thus conclusively proving the practicability of attaining this speed, especially on a 7-foot gauge track constructed for the purpose, few data exist as to the values of train resistances from 100 to 130 miles per hour, or as to the cost of maintenance of rolling stock operating at these speeds. Data on the value of train resistance at speeds below 80 m.p.h., however, exist in considerable numbers, and many divergent formulæ for the values of train resistance at these lower speeds have been put forward; from all the available data and from aeronautical work in recent years, it is clear that for a high-speed railway the resistance to motion through the air becomes of paramount importance. When it is considered that a train running at 120 m.p.h. may occasionally have to encounter a head wind of as much as 40 m.p.h., and that the resultant wind speed relative to the train will be 160 m.p.h., it will be realised that the problems involved are out of the ordinary; some idea of the mag-

nitude of the wind forces in question may be gathered if it is stated that on the basis of the formula $P = \cdot 003V^2$, the pressure on a passenger's head protruded from a window would be nearly 34 lbs. at this velocity, and the locomotive would be called upon to produce nearly 15 additional H.P. The shape of the front end of the train, the smoothness of its contour, the streamlining of all projections thus become of the first importance in the attempt to reduce to a minimum the energy required to propel the train. The estimation of the effect of the wind resistance in the 44 miles of single-track tunnel in each direction is a more difficult problem than that of estimating the resistance in the open, though it is not complicated by the factor of the natural wind, also the speeds on this section will be less than on other portions of the line. The ventilation movement in these tunnels will be in the same direction as that of the trains, thus lessening the air resistance, and it may be incidentally mentioned that with electric traction, ventilation of tunnels becomes a simple matter, owing to the absence of smoke and fumes.

The other main question of prime importance to be considered is that of designing the rolling stock to ensure safe and smooth running at such high speeds ; given a track laid and maintained to the standard of that of one of the English main lines, no difficulty should arise if the principles recently adopted in connection with high-speed electric locomotives are followed out ; the comparative flatness of the proposed route, the broad gauge and the absence of curves of appreciable radius should all contribute to the solution of this problem.

Working from these general considerations, the

following conditions may be laid down for the construction of a hypothetical train for which the probable energy consumption is to be calculated.

1. Owing to the absence of curves of short radii, there will be no objection to and considerable advantages from the point of view of train resistance, maintenance, and prime cost in making the coaches as long as possible. The coaches will be assumed, therefore, to be 75 feet in length, 13 feet wide, and 14 feet high. They might advantageously be constructed on the Gresley bogie system, in which the ends of two coaches are carried on one bogie ; this system, which gives very comfortable travelling, diminishes the number of bogies offering air resistance, and also reduces axle friction, both matters of considerable importance at very high speeds.

2. To diminish flange friction and ensure steady riding, the bogies should have as long a wheel base as possible, and a flange clearance not exceeding $\frac{5}{16}$ inch. The bogies will be assumed to be of the 6-wheel type, centred by inclined planes, wheel base 16 feet, weight 8 tons each.

3. As it is most economical from the maintenance point of view to concentrate the power in as few motors as possible on the main-line trains, haulage will be by electric locomotives of the 6-D-6 type. A further advantage arises from locomotive haulage in that, owing to the lighter bogies under the coaches, flange friction will be diminished, and easier and pleasanter riding for the passengers secured.

4. The coaches will weigh approximately 50 tons each, and the locomotive 150 tons.

5. The bodies of the coaches and locomotive will be

perfectly smooth on the outside, even the windows being perfectly flush with the panels ; the coaches and locomotive will be close coupled, the intervening space of say 12 inches being completely closed round with heavy canvas or rubber, forming an outer vestibule and ensuring the whole contour of the train being smooth.

6. The side panelling of the locomotive and coaches will be carried down to rail level, being curved inwards to almost touch the wheels ; disc wheels will be used to reduce frictional resistance which would arise from air disturbances caused by spokes ; access to bogies and other gear under the coaches will be obtained by doors in the extended panels.

7. The front of the locomotive will be formed as a parabolic wedge, to minimise end resistance. Experimental work with models of various designs on at least one-eighth, and preferably a quarter scale in a wind tunnel at air velocities up to 160–170 miles per hour to allow for the incidence of head winds will be essential to ensure a satisfactory design, and will indicate whether the side panelling suggested above, or a system of streamlining and shielding individual bogies would be preferable.

8. On these assumptions it is now possible to form an estimate of the train resistance ; in considering the results obtained, it must be remembered that no comparison can be made at high speeds between the H.P. required to move a train of ordinary construction and such a train as that described, which would be specially designed to reduce train resistance to a minimum.

9. It is evident from the above general considerations that the maximum economy in haulage expenditure

will be secured by making the trains as long as possible; it will be advantageous to run fewer and longer trains, as thereby not only will the charges for train crews' wages and maintenance of locomotives be decreased, but also the energy consumption will be diminished owing to the reduction in the number of units experiencing head resistance; on the other hand, longer trains mean longer platforms and larger expenditure on stations. The distribution of the trains as units of load on the electrical transmission system also has to be considered, but within certain limits a moderate frequency of fairly long trains will give adequate facilities to the travelling public, with a minimum of capital expenditure and energy consumption.

10. The trains of maximum weight and length will be dining-car trains, and it will be assumed that the composition of such trains, which must bear a relation to the capacity of the dining-car and the number of meals that can be served on the journey, this being three series as a maximum, will be as follows:—

> Three first-class corridor coaches each 50 tons, 100 passengers per coach; 2 third-class corridor coaches each 50 tons, 132 passengers per coach; 1 dining-car, 55 tons; 1 luggage van, 50 tons; 1 locomotive, 150 tons. Total, 564 passengers. Weight: locomotive and train, 505 tons + 30 tons of passengers + 15 tons of luggage. Total 550 tons. Length of train: coaches 525 feet, locomotive 75 feet + 15 feet for spaces for vestibules. Total 615 feet.

With a service every 45 minutes each way extending over about 17 hours per day; allowing for the substitution of a third-class coach for the dining-car on

one-third of the trains, and 22 trains each way per day with accommodation for an average of 608 passengers each, a total of 13,376 passenger seats each way per day would be provided. Multiplied by 400, to allow for additional summer traffic, this would give 10,700,800 seats for an estimated annual traffic both ways of 8,333,333 between London and Paris. Twelve similar trains would run each way daily between London and Boulogne,* providing 5,836,800 seats for an estimated annual traffic of 3,833,333 passengers. In addition, four trains in each direction would operate daily between Ashford and Boulogne.

Before proceeding further with the investigation as to the size of locomotive and motors required, it is necessary to consider the timing of the trains, the acceleration and retardation which will be considered advisable, and the maximum speeds contingent on these allowances.

It is assumed

1. That the maximum speed through the Channel Tunnel itself will not—at any rate at first—exceed 60 miles per hour.

2. That the speed in the approach tunnels will not exceed 90 miles per hour.

3. That speed is reduced to 40 m.p.h. for two sections each of 1 mile in length for permanent way repairs.

4. That the following acceleration and deceleration rates, mean values, are used :—

(*a*) leaving terminal 0·39 mile per hour per sec.;

(*b*) deceleration from 120 to 90 m.p.h. approaching entrance Tunnel, 0·2 mile per hour per sec.;

* For Northern and Central Europe.

(*c*) deceleration from 90 to 60 m.p.h. for Channel Tunnel, 0·2 mile per hour per sec.

(*d*) acceleration up exit Tunnel from 60 to 90 m.p.h. at 0·2 mile per hour per sec.;

(*e*) acceleration from 90 to 120 m.p.h. at 0·2 mile per hour per sec.;

(*f*) deceleration for terminal stop at 0·5 mile per hour per sec.:

(*g*) deceleration from 120 m.p.h. to 40 m.p.h. at 0·3 mile per hour per sec.;

(*h*) acceleration from 40 m.p.h. to 120 m.p.h. at 0·3 mile per hour per sec.

The result given by these assumptions is then as follows :—

LONDON TO PARIS.

	Miles.	Minutes.
Acceleration period leaving London terminus	5·13	5·13
Deceleration approaching entrance tunnel ...	4·39	2·50
3 miles of entrance tunnel at 90 m.p.h. ...	3·00	2·00
Deceleration to 60 miles per hour for Channel Tunnel	7·81	6·25
Channel Tunnel at 60 m.p h	24·00	24·00
Acceleration to 90 m.p.h. exit tunnel ...	7·81	6·25
90 miles per hour, balance of exit tunnel ...	1·00	0·67
Acceleration from 90 to 120 m.p.h.... ...	4·39	2·50
Deceleration from 120 m.p.h. to 40 m.p.h. for permanent way repairs ×2	12·00	9·00
1 mile at 40 m.p.h. ×2	2·00	3·00
Acceleration from 40 m.p.h. to 120 m.p.h. ×2	12·00	9·00
Deceleration for Paris stop	4·00	4·00
	87·53	74·30
Remainder of journey at 120 m.p.h. ...	165·47	82·74
	253·00	157·04
Reserve for contingencies		7·96
(2 hours 45 minutes)		165·00

LONDON TO BOULOGNE.

	Miles.	Minutes.
Acceleration period leaving London terminus	5·13	5·13
Deceleration from 120 m.p.h. to 40 m.p.h. for permanent way repairs	6·00	4·50
1 mile at 40 m.p.h.	1·00	1·50
Acceleration from 40 m.p.h. to 120 m.p.h.	6·00	4·50
Deceleration approaching entrance tunnel	4·39	2·50
3 miles of entrance tunnel at 90 m.p.h. ...	3·00	2·00
Deceleration to 60 m.p.h. for Channel tunnel	7·81	6·25
Channel tunnel at 60 m.p.h.	24·00	24·00
Acceleration to 90 m.p.h. exit tunnel ...	7·81	6·25
90 m.p.h. balance of exit tunnel	1·00	0·67
Acceleration from 90 to 120 m.p.h.... ...	4·39	2·50
Deceleration for Boulogne stop	4·00	4·00
	74·53	63·80
Remainder of Journey at 120 m.p.h. ...	37·47	18·74
	112·00	82·54
Reserve for contingencies		2·46
	112·00	85·00

Note.—The distance from the French end of the Channel Tunnel proper to Boulogne is 30,800 m. or 19·138 miles.

The rates of acceleration and deceleration chosen, represent very moderate forces of the order of a maximum of 51 lb. per ton, corresponding to 0·5 m.p.h. per sec. It must be remembered that in suburban electric-train working, acceleration is usually at a rate of 1·0 m.p.h. per sec., and the retardation somewhat higher. In actual practice, the distance in yards in which a train running at V m.p.h. can be stopped with braking equal to about 80 per cent. of the weight of the train is given approximately by the formula $\frac{V^2}{10}$; a train running at 120 m.p.h. will therefore require 1,440 yards in which to stop, with a retardation of

about 2·44 m.p.h. per sec. It will therefore be seen that the accelerations and decelerations used in the calculations leave a considerable margin for making up time.

The power required for the locomotive and the design of the locomotive now demand consideration.

Bearing in mind that the resistance offered by the air increases as the square of the speed, it is evident that for very high speeds the accurate determination of the value of this component is of supreme importance; fortunately a certain amount of data exist in regard to air pressure on surfaces, and in regard to the frictional resistance of smooth flat surfaces to currents of air passing over them.

It must be remembered that all extant experiments on train resistance have been made on trains of normal construction with many projections from the surface of the train, intervals between the coaches, and approximately flat surfaces front and rear; in the case of the proposed high-speed train, however, the front and rear will be constructed in such a form, approximating to a parabolic wedge, as to reduce the head and tail resistance to a minimum; while the surface of the train will be made absolutely smooth and devoid of projections, and the intervals between the coaches will be filled in such a manner as to ensure an almost continuously smooth surface throughout the length of the train.

In Volume 171 of the *Proceedings of the Institution of Civil Engineers*, Professor Carus-Wilson published a method of predetermining train resistance which, when applied to trains of ordinary construction, gives results which are fairly accurate in practice. It is very conveniently possible to vary the constants used by

Carus-Wilson to make the method applicable to a train of special construction.

The theoretical air pressure P_1 in lb. per sq. foot, on a flat surface of W sq. ft. at V m.p.h. is expressed by the formula

$$P_1 = \cdot 00254 V^2 W.$$

Tests made at St. Louis in 1904 showed that the resistance of a parabolic wedge was only 28 per cent. of that of a flat surface, so that for this condition

$$P_1 = \cdot 000712 V^2 W.$$

In actual practice, P_1 will have a considerably higher value than this, owing to necessary excrescences unavoidable in constructing a parabolic wedge-shaped end, such as buffers, rivet heads, and the gap between the bottom of the shield and rail level ; it therefore appears desirable to take the value of P_1 for this component as

$$P_1 = \cdot 001 V^2 W.$$

As regards frictional resistance on the surface of the train, Professor Goss,* experimenting with small models in a wind tunnel, obtained results which were only half those obtained by tests made by the St. Louis Electric Railway Test Commission in 1904 ; Goss' results, however, were substantially confirmed by experiments made by Batcheller in pneumatic despatch tubes in New York. Carus-Wilson,† after examining all the data, considered that for an ordinary train the frictional air resistance on sides and top, where P_2 is lb. resistance per 1,000 sq. ft. of exposed superficial area and V is speed in m.p.h., would be expressed by the formula

$$P_2 = \cdot 0226 V^2.$$

* *Proc. Inst. C.E.*, vol. 171, p. 318. † *Ibid.*, p. 233, etc.

Goss and Batcheller's results on smooth models indicate that for these conditions a coefficient of only about half the above value should be used; as in the proposed high-speed train it will be impossible to obtain a perfectly smooth surface, it seems desirable to choose a slightly higher value of the coefficient than half the above; the formula that will be used is therefore

$$P_2 = \cdot 0125V^2.$$

For the air resistance of the bogies and frictional resistances on the undersides of the coaches, Carus-Wilson expresses the air resistance per bogie by the formula

$$P_3 = \cdot 0066V^2 \text{ per bogie.}$$

The bogies will be considerably wider on the 7-foot gauge than on the 4 foot 8½-inch gauge, while on the other hand they will be shielded to a great extent by a prolongation downwards of the coach sides, or alternatively will themselves have streamline shields; it therefore seems reasonable to express this component as above.

The miscellaneous resistances due to flange action, journal friction, and other unclassified resistances will be termed P_4, and may be taken as of the order of 6 lb. per ton.

The proposed train will be of the following weight and dimensions :—

Total weight, including passengers and luggage	550 tons.
Total length	615 feet.
Height to top of coach from rail level	14 „
Width of coaches	13 „
Cross-sectional area	182 sq. ft.
Superficial area, roof and sides	25,220 sq. ft.
No of bogies, including 2 bogies on locomotive	12

(2 sets each of 3 vehicles mounted on 4 bogies;
1 locomotive, 2 bogies; 1 dining-car, 2 bogies).

It then follows that :

The total head and tail resistance in lb.	$=0{\cdot}001V^2 \times 182$	P_1
,, surface ,, ,,	$=0{\cdot}0125V^2 \times 25{\cdot}22$	P_2
,, bogie ,, ,,	$=0{\cdot}0066V^2 \times 12$	P_3
,, miscellaneous ,, ,,	$=550 \times 6$	P_4

The following table shows the relative values of these resistances, and the H.P. required at the tread of the wheels of the locomotive at speeds from 60 to 160 m.p.h.

m.p.h.	P_1 lb.	P_2 lb.	P_3 lb.	$P_1+P_2+P_3$.	P_4 lb.	Total R lb.	Lb. per ton.	H.P. at wheel tread.
60	655	1,133	285	2,073	3,300	5,373	9·77	860
80	1,165	2,018	507	3,690	3,300	6,990	12·71	1,491
100	1,820	3,153	792	5,765	3,300	9,065	16·48	2,417
120	2,621	4,540	1,140	8,301	3,300	11,601	21·09	3,712
140	3,567	6,179	1,552	11,298	3,300	14,598	26·54	5,450
160	4,659	8,070	2,028	14,757	3,300	18,057	32·83	7,704

It is important not to underestimate the train resistance, as any error in this direction would result in the provision of locomotives which would not attain the maximum speeds required, or which would lose time in bad weather.

From the above figures, it will be seen that the horse-power required at the tread of the wheel at 120 m.p.h. on the level in still air is 3,712 H.P. There are, however, other conditions to be met, which will demand a much larger horse-power; the limiting condition may be assumed as arising when the train is running at 120 m.p.h. up the worst gradient outside the Channel Tunnel, viz. 1 in 705, and is encountering

a head wind of 40 m.p.h.; the resistance due to the gradient is 3·177 lb. per ton, the resistance due to the train is 32·83 lb. per ton, the total resistance 36·007 lb. per ton, the train velocity is 10,560 feet per minute; the horse-power required at the wheel tread will be 6,337.

The total effort at the tread of the locomotive wheels will be 19,804 lb., while the pull on the draw-bar between the locomotive and the coaches may be roughly estimated as 0·6 of the total effort, say 12,000 lb.; the maximum draw-bar pull will, however, occur during the acceleration period, but will not normally exceed 25,000 lb.

It must be noted that the maximum horse-power of 6,337 would not often be required, nor would it be required for any longer period than that required to surmount the gradient.

With ordinary trains at ordinary speeds, a strong side wind exercises a much greater retarding effect than a head wind of similar strength; this is due to the fact that in such cases the flange resistance component forms a much greater proportion of the total train resistance than in the case of trains running at very high speeds, as may be observed by an examination of the figures in the table. It has, therefore, not been considered necessary to consider this condition in this broad general survey of the scheme.

In general, however, it will obviously be advisable in the interests of punctual running to provide tractors which when required will be able to exert at least 7,000 H.P. at 120 m.p.h. for a short period.

The locomotive to be used with such a train should

therefore be of 6,000 H.P. rated capacity on the one-hourly rating, for it must be noted that the longest spell of running by the train at its maximum speed in the open country will not exceed 80 minutes.

The best type of locomotive to use would be either the gearless type recently designed by the G.E. Co. of Schenectady, in which case six 1,000 H.P. motors would be used, or the Brown Boveri geared type with the motors set rigidly in the frames above the driving axles, driving gear-wheel outside the driving wheel to which the gear-wheel is connected by linkage; in this case the equipment would consist of four 1,500 H.P. motors.

Though no electric locomotives of this size have as yet been constructed, it is not to be anticipated that any serious difficulty would arise in their design, as the 7-foot gauge will permit the use of motors at least twice as powerful as the 4-foot 8½-inch gauge will allow.

A point worth considering is the adhesion required to meet the torque; assuming that the accelerating force were exceptionally as high as 36,000 lb., this force distributed over four axles would be 9,000 lb., or about 4 tons per axle, which would demand an adhesive weight of about 20 tons per driving axle to avoid slipping on a wet rail; this about corresponds with modern practice in England on the 4-foot 8½-inch gauge.

The locomotive when exerting a tractive effort of (4×4 tons) 16 tons would accelerate a 550-ton train at 0·936 foot per sec. per sec. or 0·638 m.p.h. per sec., thus attaining a speed of 60 m.p.h. in 94 secs. The assumed accelerations on p. 42 are therefore well within the mark.

The question also arises as to whether a motor of 1,500 H.P. can be designed to fit into a locomotive of the Brown Boveri design with an external gear-wheel; with a 5-foot 10-inch wheel a gear ratio of 1·5–1 should be practicable; at 10,560 feet per minute (120 miles per hour) the revolutions of the wheel would be 576 per minute, and of the motor 864 r.p.m. The pitch-line velocity of the gears would be 8,428 feet per minute, which is high, but attainable with forced lubrication, which could be provided.

The design of locomotive recommended is a double bogie machine with four driving axles, each driving wheel being driven by a motor set in the locomotive frames by means of an outside gear-wheel connected by a simple linkage with the driving wheel. This arrangement gives (1) a maximum of accessibility to motors, driving axles, and gear-wheels; (2) a high centre of gravity; (3) is equally applicable to direct-current single-phase or three-phase motors; (4) has been thoroughly tested on the Swiss Federal Railways.

The bogies should be of the inclined plane and not the swing link type.

Owing to the absence of curves of sharp radius, a long wheel base can be adopted for both driving axles and bogies.

It should be noted that the adoption of the electric locomotive for haulage on the proposed high-speed railway will bring about a diminution in the cost of both permanent way and particularly of bridges, compared with similar costs for steam haulage. This condition arises from the perfect balance of the locomotive and the low weight per locomotive axle obtainable

relatively to the power. With four driving axles on the locomotive, the weight per axle need not exceed 20 tons, while the weight per coach axle need not exceed 16 tons. These comparatively low weights per axle and per foot run will result in much diminished wear of the rail table, while recent research indicates that with the hammer blow of the steam locomotive eliminated, much higher stresses can be allowed in the bridges, and that the maintenance costs of the permanent way will be reduced.

Electrical System.—In view of the great effect on the resistance of projections from the smooth outline of the train, the use of bows such as were used in the Zossen test is objectionable; the three-phase system also involves the use of two overhead wires which is undesirable, in spite of the fact that the proposed railway is practically devoid of junctions.

The alternatives presented are the single-phase system at 11,000 volts with overhead collection; a much more compact arrangement less liable to damage, and more easily streamlined is offered by the use of the direct-current system with an under-contact third rail at 2,000 volts.

As the failure of a single overhead wire may bring the entire service to a standstill, it is imperative that the overhead equipment of a railway carrying a heavy high-speed traffic be constructed in a particularly solid fashion. This would almost inevitably involve the use of cross girders, which seriously interfere with the sighting of the signals by the men in charge of the train. With trains travelling at speeds of two miles a minute, early and unmistakable reading of signals is essential,

and it is difficult to see how this can be given with an overhead system of adequate strength.

The under-contact third-rail system has therefore been chosen.

Tests under severe conditions of the most improved methods of insulating such a rail indicate that it would offer no danger to the permanent way and other staff, even at 2,000 volts. At places where packing of sleepers is in progress, a light protective covering makes it impossible for a plate-layer to make any contact with the underside of the rail, and this covering can be left in position while trains pass, or at small cost can be applied to the whole length.

With two third rails, one at 2,000 volts above earth, and the other 2,000 volts below earth, 4,000 volts can be used on the locomotive, with two 2,000-volt motors permanently coupled in series.

At 6,000 H.P. in-put, the current per train would be 1,125 amperes; there is no difficulty in collecting this current with a pair of shoes.

This arrangement would permit of the current being supplied from sub-stations spaced at a maximum distance of 30 miles apart.

Current would best be purchased both in France and England from such stations as Gennevilliers in the one case and from the new station at Barking in the other. In each case it would be stepped up to 66,000 volts or 100,000 volts for transmission to the sub-stations. Current should be purchasable at the sub-stations for the load factor that would prevail, which should be over 50 per cent., at less than ½*d.* per unit.

TRAFFIC

Passenger Traffic.—Greater London has about 8,000,000 inhabitants, and Paris about 3,000,000 ; and the proposed Railway will thus serve a population of no less than 11,000,000 at terminal points.

Great Britain and Ireland are inhabited by about 47,500,000 people ; France and Belgium have almost exactly the same number of inhabitants ; and the population of the remainder of Western Europe, comprising Holland, Germany, Switzerland, Italy, Spain, and Portugal, is about 145,000,000, giving a total of about 240,000,000.

The following table from the Board of Trade Journal gives the number of passengers travelling between England and the Continent *via* the Channel Ports, London, and Harwich for the years named :—

Year.	No. of Passengers.*
1913	2,119,472
1920	1,329,579
1921	1,571,415
1922	1,715,971
1923	1,984,126
1924	2,164,732
1925	2,326,296
1926†	2,366,784
1927	2,486,355

* Counting both ways.
† Year of the great Coal Strike.

The traffic has now passed the pre-war level, and shows a continuous improvement. Under the most favourable conditions, it is not thought that the proposed Railway could be opened before 1938, allowing four years for preliminary investigations, international agreements, and Parliamentary discussion, and six years for actual construction. It is therefore reasonable to assume that by the time the proposed Railway is completed, the existing Continental traffic will have reached a total of two and a half millions annually, of which perhaps 10 per cent. will be Americans, who travel to and from the Continent *via* London.

It is thought that the convenience of the Channel Tunnel would alone double the traffic existing when the proposed Railway is opened, while the acceleration between London and Boulogne and between London and Paris, which has not been paralleled since the introduction of railways, would produce a further increment of traffic sufficient to maintain without diminution the number of passenger *transit-hours* which would otherwise have been occupied between the points named. This is merely another way of saying that we should expect the number of passengers to be doubled if the present transit time is halved, or to be multiplied by whatever ratio the old transit time bears to the new.

At the present time (January, 1928) there are two services each way between London and Boulogne, and the average time occupied is 215 minutes.

By the proposed Railway the distance between London and Boulogne will be only 112 miles, the run being made in 85 minutes.

The average time now occupied by the five day services each way by the short sea routes between London and Paris is 7 hours 6 minutes. The services by all other routes take longer.

As previously stated, the electric trains on the proposed Railway will without difficulty accomplish the journey between London and Paris in 2 hours 45 minutes.

The present London-Boulogne services take 2·57 times, and the London-Paris services quoted above, 2·58 times as long as will be occupied by the proposed Railway between the points named; and the assumed existing Continental traffic of 2,500,000 * has been multiplied first by 2, for the Channel Tunnel, and then by 2½, for the acceleration of journey, thus giving an estimated annual total of passengers between London and the Continent of 12,500,000.*

One factor which will certainly lead to increased traffic between London and Paris is that the shortened transit time will permit passengers to make the outward and return journey in one day, and to spend several hours in the foreign capital. For example, passengers leaving London at 8 o'clock in the morning will reach Paris by 10.45, and if they leave again by a train at 7 o'clock in the evening they would be in London by 9.45 p.m., after having spent over eight hours in Paris.

The writer is not aware of any published statistical evidence by which these estimates of increased traffic due to acceleration of journey can be supported, but it is generally understood that the Anglo-Scottish traffic

* Counting both ways.

showed considerable expansion following the reduction of transit times inaugurated by the Railway Race to Edinburgh in 1888, and the Race to Aberdeen in 1895, and there can be no doubt at all that even prior to the War, the traffic between England and Scotland was considerably larger than the traffic between England and Ireland. Yet the difference between the populations of Scotland and Ireland is less than half a million, and Dublin is nearer London than either Edinburgh or Glasgow, but the Scottish cities have the advantage of uninterrupted land communication with England.

In April, 1872, the Midland and the other principal Northern Railways admitted third-class passengers to all their express trains, most of which had previously carried only first- and second-class passengers. This may be variously regarded as a reduction in the fares charged by express trains, or as an acceleration for third-class passengers, and the result of this policy was not merely to maintain the gross passenger receipts without diminution at their former level, but produced a positive increase of £1,664,975, or 8 per cent. over the corresponding figure for the previous year. Traffic unquestionably responds to increased facilities, and it is submitted that the estimate of an increased total of passengers commensurate with the reduction of journey time is not an unreasonable one, and is sustained by analogous statistical data.

Of the 12,500,000 * passengers estimated to travel annually between London and the Continent, it is thought that two-thirds will travel to Paris or beyond, while the remaining third will leave the line at Boulogne,

* Counting both ways.

for destinations in Northern France, Belgium, Holland, Cologne, and Northern Europe. Ninety-two per cent. of the traffic between England and Boulogne is expected to travel to and from London; the remaining 8 per cent. by a service which is intended to run between Ashford and Boulogne four times daily in each direction.

The following tables show the services and fares by the short sea routes between London and Paris and London and Boulogne on the 1st October, 1928.

1. SERVICES.

LONDON TO PARIS, OCTOBER, 1928.

Classes.	P.a. 1, 2, 3.	P.b.	P.c. 1, 2.	P.d. 1, 2, 3.	P.e. 1, 2.
Victoria, *dep.*	9·00	10·45	11·00	14·00	16·00
Route ...	Folkestone—Boulogne	Dover—Calais	Dover—Calais	Folkestone—Boulogne	Dover—Calais
Paris-Nord, *arr.*	16·05	17·40	18·10	20·55	23·05
3rd Class passengers *arr.* ...	17·35	—	—	22·34	—
Time occupied :—					
Pullman	—	6 h. 55 m.	—	—	—
P.-1-2 class	7 h. 5 m.	—	7 h. 10 m.	6 h. 55 m,	7 h. 5 m.
3rd class	8 h. 35 m.	—	—	8 h. 34 m.	—

P.a. Pullman Cars, London to Folkestone, and Boulogne to Paris.
P.b. Pullman Car train, London to Dover, and Calais to Paris.
P.c. Pullman Cars, London to Dover.
P.d. Pullman Cars, London to Folkestone.
P.e. Pullman Cars, London to Dover.

PARIS TO LONDON.

Classes.	P.f. 1, 2, 3.	P.g. 1, 2.	P.h.	P.i. 1, 2.	P.k. 1, 2, 3.
Paris-Nord, *dep.* ...	8·25	10·00	12·00	12·05	16·00
3rd Class passengers *dep.* ...	6·35	—	—	—	15·00
Route ...	Boulogne —Folkestone	Calais—Dover	Calais—Dover	Calais—Dover	Boulogne —Folkestone
Victoria, *arr.*	15·30	17·15	19·15	19·30	22·50
Time occupied :—					
Pullman	—	—	7 h. 15 m.	—	—
P.-1–2 class	7 h. 5 m.	7 h. 15 m.	—	7 h. 25 m.	6 h. 50 m.
3rd class	8 h. 55 m.	—	—	—	7 h. 50 m.

P.f. Pullman Cars, Folkestone to London.
P.g. Pullman Cars, Dover to London.
P.h. Pullman Car train, Paris to Calais and Dover to London.
P.i. Pullman Cars, Dover to London.
P.k. Pullman Cars, Paris to Boulogne and Folkestone to London.

Average time both ways, Pullman 1–2 class, 7 hours 6 minutes.

LONDON TO BOULOGNE.

Classes.	P.l. 1, 2, 3.	P.l. 1, 2, 3.
Victoria, *dep.*	9·00	14·00
Route	Folkestone	Folkestone
Boulogne, *arr.*	12·25	17·20
Time occupied	3 hrs. 25 min.	3 hrs. 20 min.

P.l. Pullman cars, London to Folkestone.

BOULOGNE TO LONDON.

Classes.	P.m. 1, 2, 3.	P.m. 1, 2, 3.
Boulogne, *dep.* ...	11·35	19·10
Route	Folkestone	Folkestone
Victoria, *arr.*	15·30	22·50
Time occupied ...	3 hrs. 55 min.	3 hrs. 40 min.

P.m. Pullman cars, Folkestone to London.
Average time both ways, Pullman, 1, 2, 3 class, 3 hrs. 35 mins.

2. FARES.

1. LONDON AND PARIS, *via* DOVER-CALAIS.

—	Single.	Return, available 1 month.	Half return.	Mean (average of single and half-return).
Golden Arrow	£4 10 4	£8 8 6	£4 4 3	£4 7 3
Pullman ...	4 5 11	7 19 8	3 19 10	4 2 10
1st class ...	3 11 1	6 10 0	3 5 0	3 8 0
2nd ,, ...	2 10 5	4 14 4	2 7 2	2 8 9
3rd ,, ...	1 15 2	3 5 9	1 12 10	1 14 0

2. LONDON AND PARIS, *via* FOLKESTONE-BOULOGNE.

—	Single.	Return, available 1 month.	Half return.	Mean (average of single and half-return).
Pullman ...	£3 19 6	£7 9 1	£3 14 6	£3 17 0
1st class ...	3 6 0	6 2 1	3 1 0	3 3 6
2nd ,, ...	2 6 6	4 7 6	2 3 9	2 5 1
3rd ,, ...	1 12 10	3 1 11	1 10 11	1 11 10

3. LONDON AND BOULOGNE, *via* FOLKESTONE.

—	Single.	Return, available 2 months.	Half return.	Mean (average of single and half-return).
Pullman ...	£2 9 7	£4 19 2	£2 9 7	£2 9 7
1st class ...	2 6 1	4 12 2	2 6 1	2 6 1
2nd " ...	1 13 0	3 6 0	1 13 0	1 13 0
3rd " ...	1 3 11	2 7 10	1 3 11	1 3 11

Assuming passengers travel in the same proportion of class and route as the facilities provided, half using single and half half-return tickets, the average fare between London and Paris for the single journey is £3 1*s*. 5*d*. The basis, however, that has been taken in the following calculations is £2, which is believed to be considerably below the true average.

Between London and Boulogne, calculated as above, the average existing fare appears to be £1 18*s*. 2*d*., but a basis of £1 has been adopted in the following estimates.

The existing single fares from Ashford to Boulogne are 21*s*. 8*d*. first-class, and 16*s*. 6*d*. third-class on rail and second-class on boat, average 19*s*. 1*d*.; but the following estimates have been calculated on an average base of 10*s*. per passenger.

Parcels, etc.—The supplementary receipts from passenger train traffic, parcels, mails, etc., are estimated at £1,000,000, or 4·8 per cent. of the receipts from passengers. In Great Britain (1927) the proportion was 24 per cent.; in France (1926) 53 per cent.

Goods Traffic.—In both the United Kingdom and France, the receipts from goods traffic are higher than the receipts from passenger traffic, the proportion in

the former case being 1·22 to 1 (1927), and in the latter country 1·73 to 1 (1926). The estimate for the proposed Railway is that they will equal 45 per cent. of the receipts from passenger traffic. By quoting statistics of the tonnage of goods passing from England to the Continent and *vice versâ*, it would be easy on paper to show a very large revenue from this source, but it is felt that the course adopted is the right one, and will not justify any charge of undue optimism. Wisely graded schedules of rates allowing for the incidence of sea competition, should, however, bring in a large traffic, which would in general be willing to pay slightly more than the sea rate for the advantages of uninterrupted land transit, and would be at the same time remunerative to the Railway Company, being high density traffic carried on the main line under exceptionally favourable conditions of transportation.

The following classes of goods, being valuable in proportion to their weight, would probably be conveyed by the Railway : Eggs, butter, fish, fruit, flowers, hops, fresh meat, new potatoes, poultry, vegetables, works of art, bullion, books, china, clocks, articles of dress, lace, glass, manufactured leather, boots and shoes, musical instruments, pictures, manufactured silk, and a proportion of spirits, refined sugar, and other French productions ; also some proportion of the manufactured linen, cotton, and woollen goods, the lighter or special articles of machinery, steel goods, and a share of the Colonial articles imported into London.* With regard

* With two exceptions, the above list of articles was given by the late Sir Henry Oakley, General Manager of the Great Northern Railway, in his evidence before the Parliamentary Committee as goods likely to be conveyed through the proposed Channel Tunnel.

to many of the commodities enumerated, speed, both in transit and delivery, is an important consideration.

English Local Traffic.—It is estimated that the traffic in England, other than the Continental traffic, will produce a total of £1,500,000 per annum, which is less than £26,000 per mile, excluding the Channel Tunnel approach section. The passenger traffic is estimated at £1,100,000 annually, and the goods traffic at £400,000, the latter being 36·4 per cent. of the former. The Railway will not have the usual network of suburban lines in the neighbourhood of the Metropolis, and will only have ten stations within a radius of 17½ miles from London. It will, therefore, be necessary to offer special facilities to stations both inside and outside the usual suburban area. Dealing first of all with the former, it is proposed to run every 20 minutes, non-stop trains from Farningham (17½ miles) to London and a similar service from intermediate stations, from about 8.0 a.m. to about 10.0 a.m. These trains would all load at a bay at the south-west side of their respective stations, and would start at the same time, or within a minute or two of each other. The speeds would be moderate, averaging from about 50 miles an hour in the case of the longest runs, to about 34 for the shortest, from Peckham to London. The trains would all travel on the same line, and would be timed to arrive at two-minute intervals. They would be accommodated at the terminus in four bays, and in the case of three of them, down-trains would be timed to leave the bay next adjoining on the down side at the same time as an up-train was due to arrive. Thus any slight delay on the part of incoming traffic would not impede the

down traffic, neither would it be necessary to retard still further a somewhat late up-train to allow a down-train to cross its running lines. In the case of the remaining bay, on the extreme down side of the section, the up-train would be timed to arrive at the buffer stops at the same time as the down-train was due to start from the last bay on the up side.

Each suburban train would remain in the terminus for six minutes, and would then return non-stop to one of the stations in the suburban district. Each would be required to clear the crossings giving terminal access to the up-lines, say 300 to 350 yards from the buffer stops, in 45 seconds, as is regularly accomplished at Waterloo; 15 seconds would be allowed for manipulating points and signals with the most modern appliances, and 60 seconds for the incoming up-train to run from the last controlling signal, say 440 yards, to the terminus. An interval of only 2 minutes would be allowed between the departure of one train and the arrival of another at the same platform. This is close fitting, but it is thought that if the terminus and its approaches were laid out with this end in view no difficulty would be experienced in working. It would be of considerable importance that motormen should not be brought to a standstill at the last home signal through too early arrival, and it is proposed to erect a post showing the point at which in normal working the down-train vacating the bay which they are about to enter should be passed. This will in no wise relieve motormen of responsibility for stopping at the home signal if at danger, but, by giving timely warning, it would permit such reduction of speed to be made as would

enable the last signal to be passed at the appropriate moment.

To overcome fog difficulties, it is intended to borrow a simple device from the illuminated advertisements, and to lay down between the rails a chain of electric bulbs, red, green, and white, successively for 100 yards in advance of the signals. When the signal was at danger, all the red lamps would be illuminated, forming a red chain, and conversely, with the signal at safety, a green chain would be exhibited. A signal transferring a train from one line to another would show a white chain. Home signals would be shown on one side of the track ; distant signals on the other. The lamps could be protected from accident by a metal case on each side rising slightly above the face level. Contrary to the drivers of steam locomotives, electric train men have a nearly vertical angle of vision, and should have no difficulty in seeing the signals at high speeds and in the worst possible conditions ; as no steam locomotives would be employed, the bulbs would not be liable to destruction by falling cinders.

On leaving the terminus, the down suburban line will be situated between its own up-line and the up-line of the outer suburban section, and will pass under the other lines lying on the near side by rather steep gradients, but easy curves, and will rise on the extreme left. It is thought that there are considerable advantages in placing the slow lines away from the centre of the track, as the frequent and reverse curves rendered necessary by platforms between the running tracks are by this means avoided. At each station a flying or burrowing junction will be provided, to enable down

local trains to reach the departure bay without fouling any of the up-lines. This will be essential if a two-minutes' service of up-trains is to be maintained. Special provision similar to that provided at termini for handling large numbers of passengers in a short time will be necessary at all stations within the suburban area, and it is proposed to introduce a system of spread-over labour for some portion of the staff, by giving them two spells of three hours each, morning and evening, to cover the rush hours.

The plan of non-stop services will double the carrying capacity of the line, as the time occupied in passing through each block section is much less for a non-stop than for a train stopping at a station. It will also save 38 per cent. of the mileage over the usual system of sending all the trains to the suburban limit, as the average round trip will be only 21½ miles, as against a full double trip of 35 miles. It will enable a larger mileage to be run during the limited rush hours by both staff and rolling stock, thus reducing the cost of both per train mile, which is the unit of earning capacity.

During the last few years a large proportion of the increase of the London suburban traffic has been captured by omnibuses and trams. Their fares roughly correspond to the season ticket rates on suburban railways, but it is thought that in many cases they provide quicker transport from home to office than is given by the railways. Passing as they do, along the principal thoroughfares, the journey on foot from home to public vehicle is generally shorter to omnibus and tram routes than to the railway station, and the road vehicles

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usually deposit their passengers nearer their offices than do the suburban railways. If railways can reduce the running time between suburban station and terminus, more time can be allowed for the passenger to reach the suburban station and to walk from the terminus to his office, without exceeding the time for the total home-to-office journey required by competing services. This would enable passengers to be drawn from a wider area, and if, for example, the effective radius of a suburban station was doubled, the area served would be increased fourfold.

No arrangements are contemplated for the conveyance of wayside passengers during the rush hours. The Great Eastern statistics have confirmed, what is indeed a matter of common observation, that the great majority of suburban travellers journey from the suburban station to the terminus, and the number travelling between any pair of suburban stations is so small as to be almost negligible. So small is it that if they alone were to be provided for there would certainly be no railway, and there can therefore be no hardship if they are left to the road-carrying agencies.

It is felt that the proposed suburban services will be popular with the public, and that they will be cheaply worked, and remunerative to the Railway Company. They have been described here in some detail, as they involve certain works which will be comparatively inexpensive if carried out when the railway is built, but would cost considerably more if added at a later date. If construction and operating policy walk hand-in-hand, the success of the proposed Railway will be

assured. A suggested time-table will be found in the Appendix.

With regard to English stations outside the London suburban area, including Maidstone and Ashford, it is proposed to give them as rapid a service as possible morning and evening by reducing the number of stations served by each train to approximately three. This may involve rather poor loading for a time, but it is thought that it will be the quickest and most effective way of building up the long-distance residential business.

The construction and operation of the proposed Railway on the lines indicated above will in many parts of rural Kent convert agricultural land into building land, with a proportionate increase in values. The profit thus accruing will, however, pass entirely into other hands, although solely attributable to the advent of the Railway and the policy of the management. Moreover, the Railway will have to pay a rating assessment based not on the agricultural value of the land as it found it, but on the value of the highway it has itself created, which again seems hardly in accordance with the principles of abstract equity.

Proposals for relieving British railways of a substantial proportion of the sums paid for local rates in return for a reduction of freight charges on certain descriptions of goods and mineral traffic were made by Mr. Churchill, Chancellor of the Exchequer, in his Budget speech in April 1928; but inasmuch as all remissions of local taxation will have to be passed on to railway users in the form of lower charges, the position outlined above is not materially altered.

The opening of the Underground railways to Golders

Green, by providing ready access to the Metropolis, created a large traffic where formerly there was none, and houses will spring up in any area in beautiful Kent, given access to London in 30–45 minutes. With the scenery provided by Nature, and the traffic facilities provided by the railway, a very considerable traffic may be expected.

English Local Goods Traffic.—It is not thought that the proposed Railway will handle a large goods or mineral traffic in England. Owing to the break of gauge, all truck-load consignments for Kent originating north of London will be conveyed to their destinations by the South-Eastern and Chatham section of the Southern Railway, but it would probably be worth while in the future to construct a short branch to the Kent coalfields in order to carry coal to the London suburban area and also to Paris.

French Local Traffic.—As in the case of England, under this heading are included all receipts to be earned by the Railway in France, through traffic to and from England alone excepted. The distance to be operated in France, excluding the Channel Tunnel approach, is 152 miles, and the Railway will provide the quickest route from Paris to the seaside, the trains reaching Boulogne in 80 minutes from the capital. The estimated receipts have been taken at £2,250,000 per annum, an average of only £14,803 per mile per annum.

The passenger traffic is estimated at £1,600,000, and the goods traffic at £650,000, being 40·6 per cent. of the passenger revenue.

It is proposed to work the suburban traffic between Paris, St. Denis, and Beaumont-Persan on the same

non-stop principle as in the London suburban district, but a similar density of traffic cannot be expected for some time to come. However, much of the country served is very suitable for building, and in Paris, as in other large cities, there is a serious shortage of houses.

Supplementary Net Receipts will consist of profit from two hotels, rent of Company's property, dwellings cottages, arches in viaduct, advertising spaces, bookstalls, shops, money changing, omnibuses, etc., and are expected to amount to £75,000 per annum.

Working Expenses.—These are estimated as £23,209,998 or 66 per cent. of the gross receipts.

The working expenses of the Railways of Great Britain in 1927 were 80·83 per cent. of the gross receipts, and this figure is the average obtained by lines varying widely in traffic density. The proposed Railway will handle an exceptionally valuable traffic under, in general, extremely favourable conditions, on a comparatively short length of line, without branches of inferior earning power, and the proportion of working expenses to gross receipts is estimated at 78·09 per cent. for the standard gauge, or 66·00 per cent. for the broad gauge. Owing to the high speeds contemplated, the power item will be a heavy one, but the Railway will be constructed with very favourable gradients and curves, in order to reduce the current consumption to a minimum. Even high speeds, costly though they are, have some compensating advantages, as they enable the train staff to cover a considerably increased mileage in the day. For example, it has been recently stated that the standard day's work for an engine-driver is 150 miles, but the men on the proposed Railway will work from London to Paris and

back, a distance of 506 miles, in the day, with an actual running time of only 5½ hours, thus materially reducing the labour charge per mile run.

Particulars of the estimated capital expenditure, proposed capital issue, estimated gross receipts, estimated working expenditure and proposed appropriation of balance available for dividend are given below :

ESTIMATED CAPITAL EXPENDITURE.

	£
English Section of Railway *	58,529,345
French Section of Railway *	99,836,549
Channel Tunnel *	30,811,200
	£189,177,094

PROPOSED CAPITAL ISSUE.

5 per cent. Debenture Stock	46,000,000
6 per cent. Preference Stock	72,000,000
Ordinary Stock	72,000,000
	£190,000,000

ESTIMATED GROSS RECEIPTS.

London to Paris, 8,333,333 † at £2	16,666,666
London to Boulogne, 3,833,333 † at £1	3,833,333
Ashford to Boulogne, 333,333 † at 10*s*.	166,666
Parcels, Mails, etc., conveyed passenger train ...	1,000,000
London to Continent goods traffic	9,749,999
Local traffic in England, passengers	1,100,000
Local traffic in England, goods	400,000
Local traffic in France, passengers	1,600,000
Local traffic in France, goods	650,000
	£35,166,664

* For details, see Appendix. † Counting both ways.

ESTIMATED WORKING EXPENDITURE.

	£
Maintenance and Renewal of Way and Works ...	3,381,580
Maintenance and Renewal of Rolling Stock ...	3,967,053
Electric Power and Running Expenses	5,765,364
Traffic Expenses	7,776,046
General Charges	825,115
Law, Parliamentary and Tribunal Expenses ...	40,153
Compensation	163,515
Rates	1,074,623
Miscellaneous	216,549
	£23,209,998

ESTIMATED RECEIPTS AND EXPENDITURE.

Estimated Gross Receipts	35,166,664
Estimated Working Expenditure	23,209,998
Net Railway Receipts	11,956,666
Supplementary Net Receipts	75,000
Balance available for Dividend	£12,031,666

PROPOSED APPROPRIATION OF BALANCE AVAILABLE FOR DIVIDEND.

Debenture Stock, £46,000,000 at 5 per cent. ...	2,300,000
Preference Stock, £72,000,000 at 6 per cent. ...	4,320,000
Ordinary Stock, £72,000,000 at 7 per cent. ...	5,040,000
Balance forward	371,666
	£12,031,666

It will be noticed that the proposed Railway has been here dealt with as a single corporation. There would be considerable advantages in a unified control of both the English and French sections of the Railway, and it would be wholly unnecessary and wasteful to have two sets of higher officials. In any case, the entire Railway would be operated as a single unit, and it is hoped that it may be found possible to arrange for the formation of a single international company to construct and work the proposed Railway.

Naturally, the English section of the Railway would

be under English law, with English fares and rates in force, and similarly the French section of the Railway would be under the control of the French Government, and French fares and rates would be charged ; it is not thought that there would be any difficulty in providing separate statistical returns for the two sections as required by the two Governments, especially as the receipts and expenditure on one side of the Channel would be in sterling, and on the other in francs.

Suitable provision would be made for the representation of both countries on the Board of Directors, and the shareholders' meetings would be held in London and Paris alternately. It is thought that the capital of the Company should be issued in sterling.

In the past, French railways have received considerable financial assistance from the State, but it was decided in the Conventions of 1921 that they must henceforward be self-supporting. Owing to the fall of the franc, the cost of living, and consequently the railway expenditure, rose, and successive increases were authorised in passenger fares and goods rates, which have materially improved the financial position of the French railways. Uniform fares and rates are now levied over the whole of France, and if railways consisting of main lines and numerous branches of inferior earning power can pay their way under the new tariff, it should not be difficult for a main line without incumbrances to do so. The recent increases of tariffs may be regarded as an effective guarantee for the future earning power of the French section of the proposed Railway.

Political considerations may, however, require the formation of two independent Companies, and it becomes

necessary to show what the respective figures would be if the two sections of the Railway were constructed and operated as self-contained units. It is assumed for the purposes of the following calculations that the gross receipts and the proportion of working expenses to gross receipts remain unchanged. In England, the issue of Debenture Stock is limited to one-fourth of the total issue ; in France there is no such restriction.

ESTIMATED CAPITAL EXPENDITURE.

	England.	France.
	£	£
Cost of Railway	58,529,345	99,836,549
Half cost of Channel Tunnel ...	15,405,600	15,405,600
Total	£73,934,945	£115,242,149

PROPOSED CAPITAL ISSUE.

	£	£
5 per cent. Debenture Stock ...	18,000,000	58,000,000
6 per cent. Preference Stock ...	28,000,000	—
Ordinary Stock	28,000,000	58,000,000
	£74,000,000	£116,000,000

ESTIMATED GROSS RECEIPTS.

London to Paris :	£	£
(England 81/253, France 172/253)	5,335,968	11,330,698
London to Boulogne :		
(England 81/112, France 31/112)	2,772,321	1,061,012
Ashford to Boulogne :		
(England 30/61, France 31/61	81,967	84,699
Parcels, Mails, etc. (G.V. Traffic) (divided in same ratio as passenger traffic)	396,303	603,697
Continental Goods Traffic : (divided in same ratio as passenger traffic)	3,863,951	5,886,048
Carried forward	12,450,510	18,966,154

ESTIMATED GROSS RECEIPTS—*continued.*

	England.	France.
	£	£
Brought forward	12,450,510	18,966,154
Local Traffic :		
Passengers and passenger train traffic	1,100,000	1,600,000
Goods	400,000	650,000
Total gross receipts	13,950,510	21,216,154
Working expenses at 66 *per cent.*	9,207,336	14,002,662
Net Railway Receipts	4,743,174	7,213,492
Add Supplementary Net Receipts	35,000	40,000
Balance available for Dividend ...	£4,778,174	£7,253,492

PROPOSED APPROPRIATION OF BALANCE AVAILABLE FOR DIVIDEND.

	£	£
Debenture Stock, £18,000,000 at 5 per cent.	900,000	
Preference Stock £28,000,000 at 6 per cent.	1,680,000	
Ordinary Stock £28,000,000 at 7 per cent.	1,960,000	
Balance forward	238,174	
	£4,778,174	
Debenture Stock £58,000,000 at 5 per cent.		
Ordinary Stock, £58,000,000 at		2,900,000
7 per cent.		
Balance forward		4,060,000
		293,492
		£7,253,492

In the following tables, the particulars given above in sterling for the French section of the proposed Railway are shown in francs, converted at 124 to the £. In France, the existing railways carry the mails without charge in recognition of State assistance in construction, but as the proposed Railway will not receive financial aid from the French Government, it is presumed that

it will receive payment for the carriage of mails to and from England, also possibly between places in France served by the Railway.

ESTIMATED CAPITAL EXPENDITURE.

	Francs.
Cost of Railway	12,379,732,076
Half cost of Channel Tunnel	1,910,294,400
Total	14,290,026,476

PROPOSED CAPITAL ISSUE.

	Francs.
5 per cent. Debenture Stock	7,150,000,000
Ordinary	7,150,000,000
Total	14,300,000,000

ESTIMATED GROSS RECEIPTS.

	Francs.
Passenger Traffic :	
Paris to centre of Channel Tunnel (for London)	1,405,006,552
Boulogne to centre of Channel Tunnel (for London)	131,565,488
Boulogne to centre of Channel Tunnel (for Ashford)	10,502,676
Parcels, mails, etc., conveyed by passenger train to centre of Channel Tunnel for London	74,858,428
Goods Traffic :	
Paris and Boulogne to centre of Channel Tunnel	729,869,952
Local Traffic :	
Passengers and G.V. traffic	198,400,000
Goods	80,600,000
Total	2,630,803,096
Working Expenses at 66 per cent.	1,736,330,088
Net Railway Receipts	894,473,008
Add Supplementary Net Receipts	4,960,000
Balance available for Dividend	899,433,008

PROPOSED APPROPRIATION OF BALANCE AVAILABLE FOR DIVIDEND.

	Francs.
Debenture Stock, Fr.7,150,000,000 at 5 per cent.	357,500,000
Ordinary Stock, Fr.7,150,000,000 at 7 per cent.	500,500,000
Balance forward	41,433,008
	899,433,008

It is true that the estimated capital cost of the Railway is large, representing in fact a far higher sum than has ever been previously offered for subscription, and doubts may be expressed as to whether it may be possible to raise the amount required.

In reply, it may be stated that the first necessity for a successful issue is a thoroughly sound scheme, reliable estimates of cost and probable traffic ; the adoption of every factor that will minimise running expenses, and promote the comfort and economise the time of prospective passengers. Whether the present scheme answers this description must be left to the judgment of experts.

In the second place, the Railway will take rather a long time to construct, and all the capital will not be required at once. In the estimates, 20 per cent. has been added to the estimated actual cost for interest on capital during construction, which is equivalent to 5 per cent. for an average of four years from the date of subscription. This would imply that the capital calls would be spread over a period of five or six years, as the work of construction progressed, although, naturally, a somewhat higher ratio would be required in the earlier part of the period to defray the cost of property purchased. If the time for the construction of the Railway is taken as six years, and the interval between the first

and last call as only five years, an average annual capital issue of 38 millions sterling would be required.

Thirdly, the two countries whose capitals are to be connected by the proposed Railway have greater financial resources than are to be found elsewhere in Europe; and the United States, still more populous and wealthy, has within the last few years made heavy investments in London railways. The people who have the money to invest have a direct and personal interest in the improvement of communication between England and the Continent, because they frequently make the journey; and if all interested parties will do what they can, it should surely not be impossible for the London, Paris, and New York money markets each to find an average sum of less than six and a half millions every six months for five years to build the proposed Railway.

There is, unfortunately, at the present time a large amount of unemployed labour in this country. Some small portion has been employed in constructing arterial roads, which are now approaching completion, and the experience thus gained would render these workers a valuable nucleus for training the very large amount of labour that will be required for the proposed Railway. The engineering works proposed are of altogether exceptional magnitude, and would provide employment for a vast army of men. In fact, it is hardly too much to say that the unemployment dole might be entirely withdrawn in the case of able-bodied men, thus relieving taxation, and avoiding the inevitable demoralisation which comes from receiving money without having worked for it.

THE TEACHING OF FOREIGN LANGUAGES

The proposed Railway will not confine its activities solely to the transportation of passengers and goods. By common consent, the teaching of modern languages is the weakest part of our educational system. The disproportionate amount of time spent on Latin is clearly an interesting relic of the Middle Ages, when Latin was the universal tongue for educated people, the Esperanto of the time. The scholastic mind moves slowly and is wedded to tradition. It still tries to turn British boys into Latin poets. It has not grasped the fact that railways during the last hundred years have brought intercommunication between peoples; that Latin is in truth a dead language, and that live languages and a live manner of teaching them are now needed. Necessities should come before luxuries. Every Englishman should speak French and German fluently, and have a knowledge of Spanish and Italian. If Sir James Barrie's League of Youth is to be realised, we must revolutionise our methods of teaching foreign languages.

The late W. T. Stead, thirty years ago, fully investigated a system of teaching foreign languages founded by François Gouin, and introduced into this country by Howard Swan, which is sometimes known as the

Direct Series system. Short sentences arranged in logical sequence, describing in the first instance the simple facts and experiences of life, are orally taught to the student as vividly and dramatically as possible, and the words, linked together in sentences, are thus inseparably connected in the mind with a mental picture of the objects and actions delineated.

Here is a specimen lesson in French:

Chemin de Fer. Le voyageur prend les billets.

1. Les voyageurs entrent dans la gare.
2. Le voyageur se rend au guichet.
3. Et demande des billets : " Deux billets, Paris—première classe, aller et retour."
4. L'employé délivre les billets.
5. Puis le voyageur demande : " Combien est-ce ? "
6. Le voyageur paie avec l'argent qu'il retire de son porte-monnaie.
7. L'employé encaisse l'argent, et rend la monnaie.
8. Le voyageur ramasse ses billets et sa monnaie.

Each sentence is explained as far as possible in the language taught, with frequent repetition, by both teacher and students, until they have it by heart, and have mentally visualised the scene described. Not until the students can repeat the lesson are they allowed to see the printed copy, which they subsequently transcribe.

Gouin's great discovery was that the ear, and not the eye, is the organ of language. The printed book was anathema to him until the pupil could speak. With his system, the pronunciation of pupils is remarkably good, as when the ear has been correctly trained it is only a matter of time and practice for the tongue to produce the required sounds. Gouin students are eager to talk, and

are free from the shyness so often shown by those who have been taught by conventional methods.

Mr. Stead had his children taught French on this system, and at the end of three months they were able to carry on an ordinary conversation in French. So much was Mr. Stead impressed with the results of the Gouin system that he termed it a "Royal Road to Languages." The present writer has had a long and thorough experience of the system, and can fully endorse Mr. Stead's verdict in every respect.

It is proposed to set apart space in the station buildings at the termini at both London and Paris for the provision of numerous small class-rooms for the teaching of foreign languages on the Gouin Series System, as it is thought that this will be a great incentive to foreign travel.

RECEPTION OF SCHEME IN ENGLAND

There can be little doubt that the public in general will welcome the proposed Railway. For business and pleasure, many travel to France and the Continent; many of us have friends there, and the Railway will render intercourse easier, quicker, and cheaper. The broad gauge has always been popular in this country, and has a high reputation both for comfort and speed. The Railway will offer one of the most important contributions of recent years towards solving the problem of housing, with rapid communication between the suburbs and the Metropolis, and as it is proposed to acquire sufficient land in the suburban district for four sets of up and down lines in addition to the three pairs each way to be laid down from the beginning, the Railway will be able to offer exceptional facilities for suburban traffic without being haunted by the fear that too much success in obtaining business might overwhelm its resources, and by involving heavy expenditure for widenings and terminals, leave it in a more unfavourable financial position than before.

With the exception of the Southern Railway, it is thought that the railway companies of Great Britain will support the scheme. Taking the present Continental traffic as 2,500,000, counting both ways, this represents 1,250,000 passengers who make the outward and return journeys. Of this number, it is believed

that two-thirds are British and only one-third foreigners, which gives an approximate total of less than 420,000 foreign visitors yearly. This seems a very inadequate figure, and is probably due to an exaggerated fear of the Channel crossing, derived from the distant past. The construction of the Channel Tunnel will bring a large increase in the number of foreign visitors to London; many of these will visit for business and pleasure various places in this country, and a new stimulus will be given to international trade, thus increasing both passenger and goods traffic on the railways throughout the country.

The amalgamation of the South Western, Brighton and South Eastern and Chatham Railway Companies into the Southern Railway has an important bearing on the prospects of the scheme. Had it not taken place, the South Eastern would have been the principal loser through the construction of the proposed Railway, while the Brighton and South Western would unquestionably have been gainers from the further movements of a largely augmented number of foreign visitors arriving in London. It is estimated that the proposed Railway will carry 12½ million passengers, counting both ways, between England and the Continent, that is, 6¼ millions each way, out and home. If we assume that 3¼ millions will be British, and 3 millions visitors from abroad, this would give an addition of two and a half million foreign visitors annually to London, over the present estimated total.

The Southern Railway serves the whole of the seaside resorts in Kent, Sussex, Hampshire, Dorset, and the Isle of Wight, also many charming districts in Surrey, Devon, and Cornwall, and when the bogey

of the Channel crossing is laid, we may expect foreign visitors to spend their holidays in England, travelling to the seaside *via* London. There are also many other places of interest on the Southern Railway, such as Hampton Court, Richmond, Kew, Brooklands, Epsom, Ascot, Goodwood, and Tunbridge Wells, and it may be taken as certain that many visits will be paid to these spots by visitors who spend a few days in this country.

The proposed Railway will carry many provincial residents from London to Paris and back, and the Southern as one of our four principal railways operating from London, may fairly expect to convey one-fourth of this additional traffic to and from London, en route for Paris and the Continent. It may be further anticipated that the construction of the Channel Tunnel will increase the number of American passengers travelling to and from the French capital *via* Southampton and London and *vice versa*, as the journey from Southampton to Paris *via* London will be accomplished in five hours. The distance from Southampton to London is 79 miles, which is comparable with the journey from Victoria to Dover Marine of 78 miles, and Victoria to Folkestone Harbour of 76 miles.

It is therefore thought that the Southern Railway will be able to secure increased business in other directions, which will in some measure compensate for the diversion of the existing Continental traffic to the London and Paris Railway.

The Southern Railway had in 1927 gross receipts amounting to £26,703,485, with a net revenue of nearly 6½ millions sterling; the continental traffic,

albeit important, is only one of the remunerative services carried on by this great company;* in any event, the management will have ample notice of impending changes, and will be able to make arrangements accordingly. Apart from the Continental traffic, the strength of the South Eastern section of the Southern Railway lies largely in its coast traffic; the proposed Railway will not have a single station on the English coast. As regards suburban traffic, the South Eastern and Chatham section alone has 66 suburban stations within a radius of 12 miles from Charing Cross, and the proposed Railway will only have 6 in the same area, so no serious diversion of traffic can be apprehended.

Speaking generally, the bulk of the traffic to be carried on the proposed Railway will be created by new facilities, and it is thought that any adverse effect on the Southern Railway would be comparatively unimportant; would be largely met by an adjustment of train services; and would, after an interval, be extinguished by the normal growth of traffic.

The Railways Act, 1921, which provided for the grouping of the British railways, authorised each railway group to fix its fares and rates, subject to the approval of the Railway Rates Tribunal, with a view to earning a standard net revenue based in the main on the aggregate net revenue of the year 1913, but this standard revenue is not guaranteed by the State in any way, and Parliament retains unimpaired its sovereign right to grant permission for the construction of new railways as may be required in the public interest.

* For example, the Southern Railway carries as many passengers to the Isle of Wight alone, as it does to the Continent.

RECEPTION OF SCHEME IN FRANCE

On the 11th June, 1842, a law was passed in the French Parliament to sanction the construction of the principal trunk railways in that country. Under this scheme the State was to provide the land, make bridges, stations, and earthworks; the companies receiving the concessions had to supply the permanent way and rolling stock, and were authorised to operate the railway for a certain number of years. At the expiry of the concession, the lines were to revert unconditionally to the State, subject only to payment at a valuation for the permanent way and rolling stock. These were attractive terms, and there was considerable competition between various syndicates to obtain the concessions. Some accepted concessions for as short a period as twenty-seven years, involving a heavy charge for amortisation of capital; others undertook to repay the State the sums expended on bridges and earthworks, and the Nord and the P.L.M. Railway Companies have actually done so for the lines originally conceded. The concession for the Railway from Paris to Amiens, Lille, and the Belgian frontier was originally granted for thirty-eight years only from 1845, while the concession for the line from Amiens to Boulogne *en route* for England was for ninety-nine years, from 1844, which incidentally indicates the greater importance of the traffic between Paris

and the industrial districts of the north-east of France and Belgium.

By a Convention with the Nord Railway Company dated 21st June, 1857, the concession for all the lines belonging to the company was fixed to terminate on the 31st December, 1950.*

It should be mentioned that the State, in granting these concessions, has strictly reserved the right to grant competing concessions in the same territory, and the concessions to the Northern of France Railway Company do not therefore preclude the State from granting a concession for the construction of the French section of the proposed Railway.†

The relations between the French Railway Companies and the State are of a somewhat unusual and complicated character, and have been produced by a series of events which will be briefly recapitulated here. A great boom in railway shares took place in 1845, during which stock rose to very high prices. This undue inflation was succeeded by a severe panic, and in 1847 a number of companies found that they could not raise the capital necessary to finish the lines they had begun, and had undertaken to complete by a certain date. Under French law, in order to ensure the completion of the railway, they were bound in such circumstances to dispose of their unfinished lines to

* All authorities agree on this date, but curiously enough, Lambert, in his valuable *Monographie du Réseau du Nord*, while quoting the 31st December, 1950 as the date of expiry, states that under this convention the concession was to run for a period of 99 years from the 1st January, 1851 (p. 37).

† " L'Etat s'est réservé formellement dans le cahier des charges de chaque concession, le droit de concéder des lignes desservant le même trafic." Colson, *Transports et Tarifs*, p. 578.

any person or persons who would buy and complete, for what price they could get for them, which at a time of financial crisis would be almost negligible, and if no purchaser could be found, the lines were to be taken over by the State, as they then stood, without payment. The Government of the day, however, decided that in view of the importance of the railways to the nation at large, it was not desirable to discourage investors by taking undue advantage of the misfortunes of those who had supplied the necessary capital ; they therefore extended the times fixed for completing the railways, and gave some measure of financial assistance. In February, 1848, before the new arrangements had time to operate, came the Revolution, which had an unsettling effect on the money market, and made the position of the companies again very difficult.

The new Republican Government proposed the purchase by the State of the entire railway system, but their project fell through. They subsequently came to the assistance of certain companies by relieving them of some of their commitments, but had to appoint receivers for several lines.

Louis Bonaparte was elected President of the new Republic in December, 1848, and three years later, by a *coup d'état*, inaugurated the second Empire.

The liberal measures introduced by the new administration resulted in a period of considerable industrial expansion and prosperity, together with a rapid development of the railway system. The extension of all concessions previously granted for shorter periods of varying duration to a uniform period of ninety-nine years, materially strengthened the financial position of

the companies by reducing their annual charges for amortisation of capital, and by assuring them of a prolonged period in which they could enjoy the reward of their pioneer labours in developing traffic. The numerous independent railway undertakings all over the country were gradually amalgamated into the six great companies, thus permitting through running, more economical and efficient management, and reducing competition to a minimum.

These favourable conditions gave a great impulse to railway construction, and while at the end of 1851 the length of lines authorised was less than 5,000 kilometres, of which 3,500 kilometres were open for traffic, by the end of 1857 the length of lines authorised, and which the companies had constructed or undertaken to construct, was no less than 16,000 kilometres. In six years the six great companies had spent two thousand million francs, and they had undertaken works which would involve the further expenditure of an equal amount. Naturally, the earlier railways had been built to connect the chief traffic centres, and in 1858, when the enormous sums of money spent, and to be spent, were considered, and compared with the traffic potentialities of the districts through which the new railways were to run, considerable anxiety began to be felt as to whether they would be remunerative. Anxiety rapidly became panic; railway stock fell enormously in value, and it became impossible for the companies to issue the debenture stock on which they were relying to finance their new works, having already exhausted their share capital.

In these circumstances, the companies were again compelled to seek the assistance of the Government,

and this was granted in the form of a guarantee of interest. Recognising that the older lines were able to pay their way, and were not in need of assistance, the Government, for administrative purposes, divided the railways belonging to each company into the Old System and New System. No guarantee of interest was accorded to the former, but the companies were allowed to receive the profits from the working, which were to be used, firstly, in paying the debenture interest; secondly, in paying a dividend to the shareholders slightly inferior to that of recent years; and any surplus was to be devoted towards paying the capital charges on the New System.

For the latter, the State guaranteed to the companies an annual net revenue sufficient to pay interest and sinking-fund charges. The advances made for this purpose were to bear simple interest at 4 per cent. As soon as the net earnings of the two systems combined exceeded the sum required to pay the debenture interest and the maximum statutory dividend on the old system and the guaranteed interest on the new system, any surplus was to be used in repaying to the State the advances which had been made.

As security for its debt, the State had the rolling stock, machinery, and plant belonging to the railway companies. By the terms of the original Acts authorising the concessions, at the expiry of each concession, the State was to take over from the company, at a valuation, the permanent way, rolling stock, machinery, and plant, and the conventions of 1859 stipulated that if at that period a company found itself in debt to the State, such debt should be made a first charge on any

sums paid by the State to the company by way of compensation for the property acquired.

In return for the very great assistance granted by the State, it was further agreed with the companies that should the normal growth of traffic permit the payment of higher dividends, after their debt to the State had been extinguished, any surplus, after a new maximum dividend had been distributed, should be divided in equal shares between the State and the company concerned.

As Colson says, the object of the conventions of 1859 was not to make heavy subventions to the companies at the cost of the State, but merely to place their credit upon an unimpeachable basis by a State guarantee of interest, until by the normal growth of traffic they were able to pay the charges on the new system from their own net earnings.*

The conventions succeeded in their object, and the credit of the companies rapidly improved. Not only were they able to proceed with the construction of the lines already undertaken, but by conventions made in 1863, 1868, 1873, and 1875, they agreed to make further railways, often in difficult country, and in thinly populated districts, where traffic could not be otherwise than slender for many years to come. Had the railway companies built these lines solely relying on the Government's guarantee of interest, they would have largely increased the sums owing by them to the State, which had to be repaid before they recovered the right of paying an augmented dividend. They, therefore, only accepted the concessions to construct these subsidiary railways

* *Transports et Tarifs*, p. 294.

with a direct contribution (often a large one) from the State towards the outlay, in addition to the guarantee of interest on the capital they themselves provided. In some cases, the State found the sums required for these subventions ; in other cases, the railways obtained the money on behalf of the State, the latter merely becoming responsible for interest and sinking fund. This money was found by means of irredeemable annuities, which were entirely independent of and distinct from the guarantee of interest.

The principle of the guarantee of interest was also applied to capital spent on new works on the older railways which had for their object the provision of increased facilities for traffic, or were intended to promote economies in working. These improvements had only a secondary benefit for the companies, as the immediate savings merely resulted in a diminution of the claim on the Government guarantee, but the State had a direct interest in the financial results of the companies' working, and was, therefore, willing to guarantee the interest on new works designed for these objects.

Taught by experience, the six great companies had shown themselves most reluctant to undertake the construction of lines of inferior earning capacity, except on terms which were very onerous to the State, but the inhabitants of the smaller towns and villages, which were as yet without railway communication, were insistent in their claims to be linked to the general system. To meet these demands, concessions were granted in 1863 and 1864 to several new companies. It was recognised that the receipts would be low, but

the lines were to be constructed in the cheapest possible way. No Government guarantee of interest was given, but sums were contributed by the State towards the capital outlay, and it was hoped that these lines would be able to pay their way. Powers were also given to the Councils of Departments to sanction railways of local interest, and assistance was given both by the State and the department concerned. In some cases, the State itself undertook the construction of new railways.

By these means, a considerable number of branch railways were constructed in various parts of France, but in 1875 many of these secondary lines found themselves in difficulties. At this time, the great companies were prosperous, partly, no doubt, by the increases in traffic brought by the subsidiary lines, and an outcry was raised that their fares and rates were excessive. It was proposed that the State should purchase many of these secondary railways, and by linking them together, form alternative systems competing with the six great companies; and steps were taken with this end in view, which resulted in 1878 in the purchase of the State Railway System in the south-west of France, M. de Freycinet being Minister of Public Works.

It was then realised that this policy was of doubtful value, as it became evident that if the leading lines were compelled by competition to reduce their charges, their net revenue would suffer, and larger claims would be made on the State guarantee of interest. The policy of State purchase of secondary railways was therefore abandoned, and they were for the most part absorbed by the existing trunk lines. These were only willing

to pay the intrinsic value of the railways, based on their net revenue earning capacity, and the State refunded to the shareholders the sums they had provided for construction, less what they had actually received from the great companies for the sale of their lines.

In 1879, M. de Freycinet prepared an important programme for the extension of the railway system in France, providing for the construction of 4,500 kilometres, which was amplified by the Chamber to a total of 8,800 kilometres. The cost was estimated at 3,500 million francs, which, with a further 1,500 millions for waterways and ports, made a total of 5,000 million francs, which were to be spent in ten years.

At that time, the finances of France appeared to be in a most prosperous condition. The yield from taxes was increasing by leaps and bounds. It was, therefore, thought that there would be no difficulty whatever in financing this somewhat ambitious programme. During the years, 1880, 1881, and 1882, the outlay, chiefly provided by the State, on new lines, amounted to 274, 328, and 378 million francs respectively, without counting the cost of rolling stock and supplementary expenditure on lines already open for traffic.

During this period, the State continued to purchase in various parts of the country secondary lines which could not meet their engagements, and owned a considerable mileage, all of low earning capacity, and mostly unconnected with each other.

From 1872 to 1879, in seven years, the total railway receipts had increased by only 154 million francs, and the advances required from the State under guarantee of interest had varied between 30 and 50 million francs

annually. Between 1879 and 1882, in three years, the receipts had risen by 182 million francs, with the result that all the companies, excepting only the Ouest, had commenced repayment of the sums advanced to them by the State.

In 1882, came the crash. The prices of securities fell, the yield from taxation diminished, a revision of the estimates made in 1879 for the cost of the railways in hand showed that they were quite inadequate. Instead of costing 3,500 million francs, it was found that they would cost 6,500 million francs, of which only 1,000 millions had been undertaken by the companies, the remainder, 5,500 millions, being at the charge of the State. Of this total, barely a fifth had been spent. In the altered financial conditions, any general scheme of State purchase of the railways, to which the Freycinet policy had been tending, was out of the question, and it became necessary to make arrangements with the great companies to carry out the numerous provincial railways which had been promised to the rural populations. This was the origin of the conventions of 1883, made between M. Raynal, representing the French Government, and the principal railway companies.

The distinguishing features of these conventions were as follows :—

1. The companies (excepting the Midi, which left the work of construction to the State) agreed to construct on behalf and at the expense of the State the railways comprised in the Freycinet programme of 1879. They were to provide for the necessary outlay by the issue of debentures on which the State guaranteed interest and sinking fund.

2. While, in the earlier conventions, the State only undertook to supply the land and construct earthworks and bridges, the companies providing the permanent way, in those of 1883, the State became responsible for the total outlay, subject only to a fixed contribution payable by the companies. This was 25,000 francs per kilometre (£1,600 per mile) in the case of the Est, Ouest, P.L.M., Midi, and Orleans Companies, this last company making a further flat contribution of 40,000,000 francs towards the line from Limoges to Montauban; the Nord, however, contributed a lump sum of 90,000,000 francs for its 425 kilometres. The total sum to be provided by the companies was 330 million francs, apart from the rolling stock and other equipment, for which they would be indemnified by the State at the end of the concession.

3. The companies were to receive from the State as advances bearing interest:

(*a*) Such sums as were necessary to enable them to distribute to their shareholders a dividend based on the average of those recently paid (54 fr. 10 for the Nord; 35 fr. 50 for the Est; 38 fr. 50 for the Ouest; 56 fr. for the Orleans; 55 fr. for the P.L.M., and 50 fr. for the Midi). This guarantee of interest was, however, limited to the 31st December, 1914, for the Nord and the P.L.M. To the Est, it was granted until the 31st December, 1935; and to the Orleans and the Midi by a decree of the 12th January, 1895, for the whole term of their concessions, expiring at the end of 1956 and 1960 respectively.

(*b*) Such sums as were required to pay interest and sinking fund charges on the debenture stock issued by the companies to finance the works undertaken.

The advances made under these two heads were repayable as soon as the net profits of a railway exceeded the amount required to pay the statutory charges (*a*) and (*b*) mentioned above. They were secured on the assets of the respective companies, and any portion still outstanding at the close of the concession was to be deducted from the sum receivable by the company from the State for rolling stock and other property acquired under the terms of the concession.

4. After a railway company had refunded to the State the advances received, with interest, the shareholders were authorised to receive, if the net earnings permitted, a higher dividend than that guaranteed by the State. This was called the reserved dividend, and the maximum limit was fixed at 88 fr. 50 for the Nord; 50 fr. 50 for the Est; 50 fr. for the Ouest; 72 fr. for the Orleans; 75 fr. for the P.L.M.; and 60 fr. for the Midi.

5. Any net profits remaining after these higher dividends had been paid, were to be divided between the State and the company concerned, in the ratio of two-thirds to the State and one-third to the company.

These conventions controlled the relations between the railway companies and the State from 1883 to 1913. The Nord Company during the whole of this period made no claim on the State guarantee. This may be ascribed to the density of population and traffic in the districts served, to good management, and the very

small portion of the Freycinet programme which fell to its share. The dividend of this company has never exceeded the reserved limit, beyond which division of profits is made with the State.

The P.L.M., after having drawn on the guarantee for several years, liquidated its debt to the State in 1896, by accepting a reduction in the annuities by which the State was paying for works carried out by the railway on its behalf, and by the end of 1912, had paid to the Government over 10½ million francs as divisible surplus profits. The Orleans and Midi Companies had only made partial repayment, and at the close of 1913 owed 280 and 337 million francs respectively, amounts which were more than covered by the value of their rolling stock. In 1908, the Ouest Company, which at no time since 1883 had been able to pay its way without Government assistance, was acquired by the State, partly, it is said, because the management, overwhelmed by the company's load of debt, but with their dividend and debenture interest securely guaranteed by the State, had lost its principal incentive to keen and economical management.

No change of direction, however, could make up to the Ouest Railway for the scattered nature of the populations served, and in 1913, the last year in which normal conditions prevailed, the State railways, of which the Ouest forms the greater part, after paying the guaranteed dividend and debenture interest, showed a deficit of no less than 84 million francs.

In this year, the Nord and P.L.M. Companies neither claimed on the Government guarantee, nor contributed surplus profits to the State; the State, Orleans, and

Midi Railways required 102½ million francs to pay the statutory charges, while the Est Company handed over 4½ millions of surplus profit to the National Exchequer. The net amount that had to be made good by the State to railway shareholders was therefore 98 million francs, or nearly 4 millions sterling. In previous years the result, although not quite so unfavourable, had been very similar.

Dealing with the war and post-war period, we find that the working expenses of the six great companies, which were 1,275 million francs in 1913, by 1920 had increased to 6,903 million francs. Contributing causes were the great advance in wages, the adoption of the eight hours' working day for all grades, and the extraordinary rise in the price of coal, which reached a maximum of 267 francs per ton in May, 1920, as against an average pre-war quotation of 25 francs. The large additions made to fares and rates, averaging from 70 to 80 per cent. for passengers and 180 per cent. for goods, did not suffice to cover the increased expenditure, and in the seven years, 1914–1920, after paying statutory dividends and debenture interest, the railways showed a total deficiency of 5,573 million francs.

The liability of the State in respect of the guarantee of interest for the Nord and P.L.M. Companies had lapsed on the 31st December, 1914, but it was felt that the credit of the companies and indirectly that of the State would suffer if default were made in the payment of interest and statutory dividend. The companies were therefore authorised to make the necessary payments, which were subsequently refunded to them by the State.

On the 10th January, 1919, a law was passed providing for the restoration of the railways to their pre-war standard, including deferred renewals, mainly at the expense of the State. The prices ruling in 1913 were taken as the base for the cost of the repairs and the renewals, and all charges above that level were defrayed by the Government. Permission was also given to replace rolling stock and stores and to pay supplementary allowances to the staff in compensation for the high cost of living. The operation of the law was limited to the 31st December, 1920, but it was subsequently found necessary to extend it.

The actual deficit, apart from war damage, for the six principal railways for the seven years, 1914–1920, is given as under:

Railway company.	Net Revenue account.	Allowances received under Law of 10th January, 1919.	Totals.
	Million francs.	Million francs.	Million francs.
Nord	1,063	161	1,224
Est	503	157	660
Paris-Lyon ...	1,186	273	1,459
Orleans... ...	825	162	987
Midi	388	86	474
Etat	1,608	223	1,831
Total ...	5,573	1,062	6,635

Converted at 60 francs to the £, the rate ruling in 1920, the total of 6,635 million francs represents a sum of 110 millions sterling, paid by the State to railway share and debenture holders by way of guarantee of interest for the seven years, 1914–1920.

As far back as 1917, the financial position of the French railways had caused anxiety in Government

circles, and in October of that year a strong commission was appointed by M. Claveille, then Minister of Public Works, to consider proposals for placing the relations between the railways and the State on a fresh basis. The terms of reference to the commission laid down as an absolute principle that the financial situation in France rendered it imperative that the total receipts of the entire railway system should year by year equal the total expenses of the system, including therein working expenses as ordinarily understood, and also the charges for guaranteed dividend, interest on debenture stock, and amortisation. They also stressed the essential unity of the French railway system, and suggested financial unification, under which uniform fares and rates were to be charged throughout the whole of France, and all receipts and expenses were to be pooled in a common fund. It was also proposed that financial inducements should be offered to the companies and their staffs in order that they should be directly interested in the encouragement and economical handling of traffic.

The commission reported favourably on the scheme towards the end of June, 1918, making certain definite proposals ; prolonged conferences took place with the representatives of the railway companies ; committees appointed by both Houses of Parliament examined and reported on the proposals, and in 1921, after certain modifications had been agreed to they were finally adopted.

From the 1st January, 1921, the working of the railway systems conceded to the Est, Midi, Orleans, Nord, and Paris-Lyon-Mediterranée Companies, as

well as that belonging to the State, has been controlled by an agreement which, under the authority of the Minister of Public Works, provides for:

1. A common organisation destined to assure the co-ordination of the working of the different systems in harmony with the general interests of the nation.

2. A co-operation of the railways between each other and with the State, and a financial solidarity for the entire system, which will assure the establishment and maintenance of an equilibrium between the charges of all kinds and the traffic receipts.

The common organisation is achieved by means of a Superior Railway Council, composed of members nominated by the Minister of Public Works, representatives of the management and of the staff of the principal railways, and thirty representatives of the general interests of the nation. They have considerable powers, and are competent to advise on such questions as the following:—

The construction of new lines.

Modifications in the financial *régime* of the railways.

Programmes of supplementary works.

Programmes of electrification.

Programmes for interchange of traffic between the different railway systems; also with ports, waterways, and other means of communication.

Programmes for the purchase and standardisation of rolling stock.

General rules for railway working, and uniform methods of signalling.

Fares and rates, and their uniform application over the whole country; also their revision as may be

necessary, in order to ensure that the total receipts of the French railways cover the total outgoings.

Conventions with foreign railways respecting the provision of new railway junctions, traffic pooling agreements, and the periodical modifications of the time-tables for international trains.

Authority to issue debenture stock.

The working conditions and remuneration of the staff, also their retiring pensions.

The financial solidarity of the railways of France is established by means of a common fund. Any railway which has a surplus after paying working expenses and financial charges, including statutory dividend, will pay in such surplus to the common fund, while any railway which shows a deficiency will be entitled to draw the amount of such deficiency from the common fund.

If the total revenues are inadequate to pay the total expenditure in any given year, and the common fund has not a sufficient balance in hand to make up the deficiency, the Treasury will advance, by way of loan, the sums required.

All deficiencies in the common fund from 1921 to 1926 inclusive were to be raised by the sale of annuities. The State was to bear the cost of these annuities until the end of 1926, after which they became a charge on the common fund of the combined railway system.

At any time between the 1st January, 1921, and the 31st December, 1926, the Minister of Public Works may, on the advice of the Superior Railway Council, revise fares and rates within such limits as may be indicated by the general economic condition of the country. At the end of this transition period, fares

and rates shall be automatically revised, if necessary, and subsequently every five years until the expiry of the concessions, and shall be so calculated as to provide an equilibrium between receipts and outgoings for the combined railway system taken as a whole, and to make good any deficiency or to absorb any surplus accruing from the preceding quinquennial period. The word " outgoings " in the preceding sentence refers to working expenditure as ordinarily understood ; interest on debenture stock, by which the greater part of the capital for the French railways has been raised ; guaranteed dividend ; amortisation ; potential bonus to both companies and staff, as explained later ; and the charges for annuities by which the serious deficiencies for the period 1921–1926 have been, are being, and will be met.

Having guaranteed dividends and debenture interest to railway shareholders, and having, on paper at least, provided that any sums advanced by the State in one quinquennial period should be recovered from the railway users in the next, it became necessary to offer to the railway companies and their staffs incentives to enterprising and economical management. This has been done by means of bonuses.

The bonus for each individual railway company will consist of two independent elements :

A. Three per cent. on any increase in annual gross receipts as compared with those for 1920, due regard being paid to any variation in fares and rates. When this increase amounts to 20 per cent. on the 1920 figures, the rate on any further increase will be 2 per cent.

B. One per cent. of the diminution, as compared with the returns for 1920, of the deficiency of receipts to expenses, or if the receipts are in excess of the expenses, 1 per cent. of the excess and of the deficiency of 1920 combined.

When equilibrium between the receipts and expenses of the entire French railway system is realised, the bonus "B," in the preceding paragraph, will be increased by 1 per cent. of the diminution of the deficiency or the increase of the surplus, as compared with the accounting period in which equilibrium is attained.

The companies are not to receive the full bonus on economies of working which may be caused by the fall of coal and coke from the famine prices prevailing in 1920, and it is provided that half the difference in the cost of combustibles consumed in that year as compared with 1921 shall be deducted from the 1920 figures when used as a basis of comparison with the years 1921 to 1926 inclusive, and the whole difference between 1920 and 1921 shall be deducted from the 1920 figures when used as a basis of comparison for 1927 and following years.

If the accounts of a particular railway company show in any subsequent year a greater deficiency than in 1920, the company will be penalised to the extent of 2 per cent. on the difference. This penalty will be deducted from any bonus due in future periods for improved working results under Clause B.

If the bonus earned by a railway under Clauses A and B exceeds one-third of a figure separately fixed for each railway, ranging from 6,250,000 francs for the

Midi, to 20,000,000 francs for the Nord, and 28,000,000 francs for the P.L.M., half of the surplus shall be paid into the common fund, and if, after this payment has been made, the bonus still exceeds two-thirds of the named figure, two-thirds of the surplus shall be paid into the common fund.

The staff of each railway are to receive a bonus under Clauses A and B calculated as for the company, but without deduction for payments to the common fund as noted in the preceding paragraph. The bonus receivable by the staff will be doubled until it amounts to 1·5 per cent. of the gross receipts for the accounting period in question, after which it will increase by the addition of sums due under Clauses A and B without doubling.

When a railway company has earned a bonus under the terms of the foregoing arrangements, it will be entitled to pay a dividend in excess of the statutory rate, and the staff will also receive a gratuity. The State will defray the cost of the annuities issued to cover losses in the period 1921–1926, which may comprise certain payments on account of the bonus, to the end of that period, but from 1927 and onwards these rewards will have to be provided by the traffic, and will not be contributed by the State or other sources outside the railways.

The debts due to the State by certain railway companies for sums advanced by way of guarantee of interest will cease to bear interest from the 31st December, 1914, and will only be payable at the end of the concession, or in the case of purchase by the State.

The State will defray all debts contracted by

the companies for the payment of guaranteed dividends and debenture interest from 1914 to 1920 inclusive.

When the systems of two of the contracting railways have been acquired by the State, either by purchase or through the expiry of the concession, any one of the remaining companies will have the right, after a delay of three months, to claim and obtain purchase by the State, and such purchase shall take place on the first day of January next succeeding.

The State undertakes to restore all the French railways which have been affected by hostilities to the condition in which they were at the outbreak of war, and the railway companies and the administration of the State railway system agree to refrain from instituting legal proceedings to enforce any claim which might have been made in this respect.

The expenses of the Superior Railway Council are to be defrayed by the railways in the ratio of their respective gross receipts for the preceding year.

Unfortunately the efforts to restore the financial equilibrium of the French railways were retarded by currency troubles. From 1921 until 1926 the franc continued to fall, thus increasing the cost of all combustibles and materials used, also the cost of living and consequently the wages expenditure of the railway companies. Increases in fares and rates were made from time to time, but the falling franc remained master of the situation, and the total earnings of the six great railways of France failed to equal the total outgoings, as will be seen by the following figures :—

Year.	Deficiency.
1921	1,390,000,000 francs.
1922	764,000,000 „
1923	686,000,000 „
1924	303,000,000 „
1925	350,000,000 „

These deficiencies were met by the sale of debentures, bonds, and annuities at home and abroad, often at a discount and bearing a relatively high rate of interest.

In 1926, business was artificially stimulated by inflation, and the passenger fares and goods rates were increased no less than three times, the year's working resulting in a surplus of 581,000,000 francs for the combined railways, including those of Alsace and Lorraine.

The practical stabilisation of the franc at the commencement of 1927, however, caused a reaction in business activity, and the movement of traffic on the railways became below normal ; in consequence, the seven great railways of France, after paying statutory dividends and bonuses to shareholders and staff, report a net deficiency of 253 million francs on the year's working, made up as follows :—

FRENCH RAILWAY RESULTS, 1927.

Railway.	Million francs.
Nord	20.1 surplus
Est	102.0 „
Paris-Lyon	21.1 „
Alsace-Lorraine	32.3 „
Orleans	83.7 deficiency
Midi	73.8 „
Etat	271.1 „
Total	253.0 net deficiency in working.

To this figure must be added the charges amounting to 500 million francs for the annuities issued to cover the railway losses from 1921 to 1925, defrayed to the end of 1926 by the French Government, but which became payable by the French railways from the 1st January, 1927, and which bring the total deficiency for the year to approximately 750 million francs.

A well-informed writer in the *Revue Générale des Chemins de Fer* for August, 1928, states that the traffic returns for the early months of 1928 show an improvement, and that goods rates were again increased on the 1st March; he further suggests that the heavy burden of Government taxation which has risen from 166 million francs in 1913 to 2,026 millions in 1927,* and discriminates rather unfairly between the railways and other forms of transport, should be reduced, in order that additional traffic may be attracted to the railways.

The salient features of the present *régime* are the establishment of a Central Board of Control, and the pooling of receipts and expenditure; in other words, the unification of the French railway system.

The proposals for a direct railway between London and Paris will be welcomed in Paris from a political point of view, and from a financial aspect they will be judged as to their effect, not on a single French railway, but with regard to the French railway system as a whole. This marks a very important advance on the pre-war position.

It is not thought that there can be two opinions as

* Five Companies only; Etat and Alsace-Lorraine figures not yet available.

to the advantages which the construction of the proposed railway would confer on the railways of France. All the railways radiating south, east, and west from Paris would benefit, in greater or less degree, from the establishment of unbroken rail communication with London in less than three hours, particularly those serving the south of France, Italy, Switzerland, and South Germany. To the three last-named countries there are alternative routes competing with the French companies for the traffic to and from England, and the striking acceleration proposed between London and Paris would, it is thought, place the French railway companies in a very favourable position for securing practically the whole of this traffic, which, with the Riviera business, might be expected to show considerable expansion.

On the other hand, the Nord section of the amalgamated railways would lose the English traffic between Calais, Boulogne, and Paris, and some portion of the local traffic between Boulogne, Amiens, and Paris. The important traffic between Paris, Belgium, and Northern Europe would be unaffected, as would also the services between Paris and the manufacturing and mining districts grouped round Lille, Roubaix, and Lens, and the other industrial centres in the north-east of France.

The shortening of the transit time between London and Boulogne, with the added advantage of the Channel Tunnel, will, however, unquestionably lead to a considerable increase of traffic between England and Northern France, Belgium, Holland, Cologne, and Central and Northern Europe *via* Boulogne. The haul from Boulogne (Tintelleries) to the Belgian frontier at

Baisieux, *via* Calais and Lille, is 160 kilometres, and is therefore rather more than half the distance between either Calais or Boulogne and Paris, which are respectively 298 and 254 kilometres. The important manufacturing town of Tourcoing is the same distance from Boulogne as Baisieux ; Roubaix is three kilometres less. If the proposed Railway can hand over at Boulogne to the Nord Railway two additional passengers for conveyance to the Belgian frontier, Tourcoing or Roubaix, for every one that is lost between Paris and Boulogne or Calais *en route* to or from England, and further, such extra traffic to other points on the Nord system as shall compensate for the loss of the traffic conveyed locally between Paris, Amiens, and Boulogne, with a proportionate increase in goods traffic, the Nord Railway will not be a loser through the construction of the proposed Railway between London and Paris.

With the exception of Boulogne and two or three small stations to the north of it, the London and Paris Railway will not have access to the sea coast of France. A considerable expansion of tourist traffic from England to French and Belgian Channel resorts may be anticipated as a result of the construction of the Channel Tunnel, and a very large portion of this traffic will be handled on some part of its journey by the Nord Company, whose littoral, 100 miles in length, extends from the Belgian frontier, 20 kilometres north-east of Dunkirk, to Tréport in Normandy. From Boulogne to Tréport, *via* Abbeville, the distance is 116 kilometres. This Company also operates between Amiens and Rouen (117 kilometres), conveying traffic for Havre, Deauville, and north-western France generally.

There is good ground for the belief that following the opening of the proposed Railway with the Channel Tunnel, Boulogne will become a railway centre second in importance to none on the Continent. It lies in the very heart of the territory served by the Nord Railway, and, as will be seen in the following table, the nearest point of contact with other railway systems is over 100 kilometres distant.

	Kilometres.
Distances from Boulogne to :	
Belgian frontier at Ghyvelde (for Ostend)	101
Etat Railway at Tréport (for Dieppe, Fécamp and Etretat)	116
Belgian frontier at Baisieux (for Brussels, Antwerp, Amsterdam, Liège, Cologne, Berlin, Warsaw, and Riga ; also Bremen, Hamburg and Copenhagen) ...	160
Est Railway at Hirson, *via* Lille (for Luxemburg, Nancy, Metz, Strasburg and Basle)	270
Est Railway at Laon, *via* Amiens (for Rheims) ...	231
(From Amiens to Laon the distance is 108 kilometres).	
Amiens to Rouen (for North-Western France) ...	117

In view of the anticipated five-fold increase of traffic resulting from the construction of the proposed Railway, which will bring Boulogne within 85 minutes of London ; the substitution of Boulogne for Calais for English traffic to and from Belgium and beyond, which will give an additional haul of 40 kilometres per passenger to the Nord Railway ; and the substantial distances which have to be traversed on the Nord Railway for traffic on all the through routes, there would appear to be every reason to anticipate not only no falling off in the net earnings of the Nord Company, but an actual and positive gain ; and, indeed, it is more than probable that this company, in spite of the loss of the English traffic, will derive a greater benefit from the

opening of the London and Paris Railway than any other railway in France.

The concession to the Nord Railway is due to expire on the 31st December, 1950. Articles 59 and 60 of the Company's Act granting the concession expressly provide that the Nord Company is debarred from raising any objection or claiming any compensation in the event of the construction of another railway in the same district being subsequently authorised by the French Government.* The terms of reference to the Railway Commission of 1917 definitely opposed a solution of the railway problems by prolonging the concessions.

On the other hand, the concession to the Nord Company under present arrangements, will be the first to expire. The concession to the Est Railway has been extended to terminate on the 26th November, 1954; those of the Ouest (in liquidation) and Orleans on the 31st December, 1956; the P.L.M. 31st December, 1958, and the Midi 31st December, 1960.

The Nord Company has served the public well, none better. Their management has been good and economical; their locomotive work excellent; their main line rolling stock beyond reproach. Would it not

* The text of Articles 59 and 60 in the *Cahier des Charges* of the *Chemin de Fer du Nord*, is as follows :—

Article 59.—Dans le cas où le gouvernement ordonnerait ou autoriserait la construction de routes . . . de chemins de fer ou de canaux qui traverseraient les lignes objet de la présente concession, la compagnie ne pourra s'opposer à ces travaux ; mais toutes les dispositions nécessaires seront prises pour qu'il n'en résulte aucun obstacle à la construction ou au service du chemin de fer, ni aucuns frais pour la compagnie.

Article 60.—Toute exécution ou autorisation ultérieure de route, de canal, de chemin de fer, de travaux de navigation dans la contrée où sont situés les chemins de fer objet de la présente concession, ou dans toute autre contrée voisine ou éloignée, ne pourra donner ouverture à aucune demande d'indemnité de la part de la compagnie.

be a graceful act, in recognition of their past and present services, coincidently with the passing of the Bill for the construction of the proposed Railway, to decree an extension of the concession to the Nord Railway Company to the date already assigned to the Midi Company, *i.e.* the 31st December, 1960? This would go far to remove any feeling which might be caused by the construction of the proposed Railway, and would enable the two companies to co-operate harmoniously, from the start, in the measures to be taken at Boulogne for the transfer of traffic.

France has much to gain and little, if anything, to lose by improved communication with London, and when the proposals contained in this little book have been explained and considered, it is thought that they will receive the unqualified approval of the French people.

THE CHANNEL TUNNEL AND NATIONAL DEFENCE—I.

M. Sartiaux, in the *Revue Politique and Parlementaire* of the 10th July, 1906, has given an interesting account, published in English by the Channel Tunnel Company, of the various schemes which have been proposed for providing unbroken connection between England and France.

In 1802, a mining engineer named Mathieu placed before Napoleon plans for making a tunnel between the two countries for the conveyance of mails. The Varne bank, situated in mid-Channel, was to be raised and transformed into an island, and tunnels, each some 10 miles in length, lit by oil lamps and ventilated by shafts, extending above the surface of the sea, were to be driven to England and France respectively.

Several schemes for bridging the Channel have been put forward at different times ; Thomé de Gamond suggested in 1834 a submerged tube, subsequently a system of ferries, and finally a Channel Tunnel as now advocated.

With his investigations from 1833 to 1867 the proposal of a Channel Tunnel assumed a practical shape. By taking a large number of soundings in the Channel, he was the first to establish the continuity of the geological beds across the sea bottom, and his researches

have been amply confirmed by those of MM. Potier and de Lapparent.

The lower chalk is 87 feet thick at Dover, and at Sangatte has a depth of 80 feet. The outcrops of the geological strata in the bed of the Channel are so placed as to indicate with practical certainty that the belt of lower chalk is uniform in thickness from one side of the Channel to the other. This chalk is comparatively soft, being readily cut by a boring machine; it is impervious to water, and free from flints; and it would be impossible to find a medium more admirably adapted in all respects for the construction of a submarine tunnel.

In 1869, an Anglo-French Committee was selected by Thomé de Gamond, with the object of forming a company on each side of the Channel to carry out experimental work, and ultimately to build the Channel Tunnel. In March, 1870, the French section of the committee applied to the French Government for a perpetual sole concession for the construction of a submarine railway from the French coast to mid-Channel, and the French Ambassador in London was instructed by his Government to ascertain the views of the British Government on the project, and whether they would be prepared to enter into a diplomatic agreement for the construction and working of the line. The British Government had not fully considered the proposal, and replied that they were not prepared to give a definite answer.

War was declared between France and Germany in July, 1870, and the third Republic was proclaimed on the 4th September, 1870. In June, 1872, in reply to

an inquiry from the French Government, Lord Granville, then Foreign Secretary, instructed Lord Lyons, the British Ambassador in Paris, to say that Her Majesty's Government saw no objection in principle to the proposed tunnel between France and England.

The French Channel Tunnel Committee having again applied to their Government for a concession, their proposals were examined by a special committee appointed by the Minister of Public Works, which in July, 1874, reported favourably on the scheme, but declined to sanction its construction until an international agreement with England had been reached, and preliminary works costing not less than two million francs, had been carried out to demonstrate by trial borings and soundings in the Channel that the construction could be entered upon with a large probability of success.

In October, 1874, the French Ambassador in London forwarded to Her Majesty's Secretary of State for Foreign Affairs a copy of the Report of this Committee, and requested to be informed as to the views of Her Majesty's Government, and on the 24th December, 1874, Lord Derby wrote to the British Ambassador in Paris stating that " of the utility of the work in question, if successfully carried out, there appears no room for any doubt ; and Her Majesty's Government would therefore offer no opposition to it, provided they are not asked for any gift, loan or guarantee in connection therewith." Power would be reserved to erect and maintain such military works at the British end of the tunnel as might be deemed expedient, and the Ambassador was authorised to communicate to the French Government that Her Majesty's Government approved

of the course which they proposed to follow with regard to the undertaking.

January, 1875, saw a Bill for the French section of the Tunnel laid on the table of the National Assembly, and a copy of the English Channel Tunnel Bill to be submitted in the approaching session of Parliament was sent by the Board of Trade to the Foreign Office.

Two months later an international commission consisting of six members, three of whom were nominated by the British and three by the French Governments was appointed; it sat both in Paris and in London in the early months of 1876. The commission agreed that the jurisdiction of each country should cease at a point in the Tunnel midway between low-water mark on the English coast and low-water mark on the French coast. They also suggested that a permanent international commission of six members should be set up to advise the two Governments on all questions respecting the construction, maintenance, and working of the submarine railway, and for the drafting of supplementary conventions making provision for the apprehension and trial of alleged criminals for offences committed in the tunnel or in trains which had passed through it; also in connection with customs, police, and postal arrangements. A very practical and useful report.

Both the English and the French Channel Tunnel Bills were passed by their respective Houses of Parliament, and they received the assent of Her Majesty and of President MacMahon respectively on the same date, 2nd August, 1875.

"It may here be noted that the character of these two Bills was very different, the French measure being

a definite concession to the promoters of the proposed railway of the right to make a tunnel towards England, provided certain conditions were fulfilled, while the English Act of Parliament merely authorised the Channel Tunnel Company to acquire lands at St. Margaret's Bay and carry out such operations as might be authorised by the Board of Trade, under the proviso that the company should be bound by any conditions which might afterwards be imposed, in consequence of negotiations with the French Government." *

" At the close of 1876 the position of affairs was as follows :—

" The French promoters had obtained their concession subject to certain conditions, and the capital required was to be found, half by the Chemin de Fer du Nord, one-quarter by the French House of Rothschild, and one-quarter by the promoters and their friends.

" The English company had no concession, but merely the right to experiment at St. Margaret's Bay, and they only issued a prospectus proposing to raise a capital of £80,000 for experiments. This capital, partly owing to commercial depression, was never raised, and the year allowed for the purchase of land having expired in August, 1876, the work remained in abeyance. This being so, the works of the French promoters (who held their concession partly on condition of agreeing with an English company working to meet them) appear to have languished also, and consequently no efforts were made to proceed with

* Precis of Papers relating to the Proposed Channel Tunnel, 1882 (C. 3358), p. xii.

the ratification of the treaty, of which the report of the Joint Commission was to have been the basis." *

"On the 2nd August, 1880, five years had elapsed since the concession had been granted to the French promoters, and according to the terms of that concession they ought within this period to have come to terms with a duly authorised English company having powers to tunnel to meet them. This not having been done, the promoters were obliged to apply for the extension of three years provided for in the concession.

"In the same year, however, a second English scheme was brought forward in addition to the original "Channel Tunnel Company." This new scheme was initiated by the Chairman of the South Eastern Railway Company, and was based on the results of experiments made by sinking shafts on the property of that railway company in the neighbourhood of Dover.

"These experiments, for which the South Eastern Railway Company, under the sanction of the South Eastern Railway Act, 1874, had authorised the directors to spend £20,000, were continued during 1881, and at an extraordinary General Meeting of the South Eastern Railway Company held in London on the 16th June, 1881, the Chairman announced to the shareholders that the results showed the possibility of completing an experimental tunnel 7 feet in diameter within a period of five years, work being carried on simultaneously from both ends. The Chairman, moreover, referred to an understanding between himself and M. Raoul Duval, one of the original French promoters to whom the concession of 1876 had been granted.

* Ibid., p. xiii.

"The report of this meeting having attracted the attention of the Board of Trade, a suggestion was made to the War Office that a Departmental Committee should be appointed," and "in consequence of this suggestion, a committee consisting of Mr. Farrer as Chairman, Vice-Admiral Phillimore, and Colonel J. H. Smith, R.E., was appointed on the 22nd August, 1881." *

This committee held its first meeting on the 13th December, 1881, at which Sir Edward Watkin gave evidence. At a subsequent meeting on the 25th January, 1882, Lieut.-General Sir Garnet Wolseley, Adjutant-General, afterwards Lord Wolseley, who had previously submitted to the committee a lengthy and strongly worded memorandum opposing the Channel Tunnel on grounds of national safety, gave evidence. Sir Garnet Wolseley urged in his memorandum that no question of such vital importance had ever before come up for the serious consideration of the nation; that there would always be a risk of our end of the tunnel being seized by surprise or by means of treachery, and that its seizure would place England at the mercy of the invader.

On the 31st January, 1882, Admiral Sir S. Cooper Key wrote to the First Lord stating his opinion that the construction of the tunnel would render necessary a vast expenditure in fortifications, or the maintenance of a standing army as large as those of other European nations. Mechanical contrivances for destroying the tunnel could not be relied on. If an enemy obtained possession of the tunnel, a large army might march on

* Ibid., p. xiii.

London, while our Navy looked on as a helpless spectator.

On the other hand, Lieut.-General Sir John Adye, Surveyor-General of Ordnance, who also submitted a memorandum and gave evidence, did not consider that any great danger to this country would be created by the completion of a submarine tunnel. It could not be used for the purpose of invasion unless our end of it had been previously seized, and the end could only be seized after a successful invasion by sea. The defence of the tunnel exit was a simple operation, and the destruction of the tunnel, should such be necessary, would be equally so. The precautions to be taken were of a comparatively simple character.

On the 1st February, 1882, the chairman of the committee informed the President of the Board of Trade that during the course of the inquiry the effect which the construction of the tunnel might have on the military defences of the country had assumed great importance, and that the committee desired to have further military and naval evidence on this subject.

In reply the President of the Board of Trade, Mr. Joseph Chamberlain, informed the chairman that as the final decision of a question of such magnitude would not rest with a departmental committee, but must be settled on the responsibility of the Government as a whole, he would not prolong the labours of the committee.

A scientific committee was appointed by the War Office on the 23rd February, 1882, under the Presidency of Major-General Sir A. Alison, Bart., to make a full and exhaustive investigation into the practicability

of closing effectually a submarine railway tunnel proposed to be constructed between France and England. They were to satisfy themselves whether it was certain, beyond any reasonable doubt, that in the event of war or apprehended war, the tunnel and its proposed approaches under existing Acts and the Bills then before Parliament, could be rendered absolutely useless to an enemy, and in what manner

The committee completed its inquiries on the 12th May, 1882, and the following are the main features of their report :—

" The committee considered that it was undesirable that the end of the tunnel should be within effective range from the sea, and decided that the following conditions were essential :—

" The tunnel should not emerge within any fortification, but its exit as well as the air-shafts, pumping apparatus, etc., should be commanded by the advanced works of a fortress.

" There should be means of closing the tunnel by a portcullis, and also of discharging irrespirable gases into it.

" There should be power to produce a temporary demolition of the land portion of the tunnel by means of mining.

" There should be arrangements for a temporary flooding of the tunnel by sluices.

" There should be arrangements for a permanent flooding of the tunnel by mines which should open a direct communication between the bottom of the sea and the tunnel.

" The mechanical arrangements required for tem-

porary obstruction should be capable of being controlled from different points within the fortifications, and the means of destroying the tunnel should be controlled, not only from the central work of the fortress, but also from one or more distant places, which should have distinct communications with the mines, independent of those of the fortress." *

The committee also considered the two schemes for which Bills were before Parliament, and decided that neither of these schemes, as defined by the Bills, could be recommended, inasmuch as they failed to fulfil some of the conditions mentioned above as being essential.

The War Office Committee concluded by recording their opinion that "it would be presumptuous to place absolute reliance upon even the most comprehensive and complete arrangements which can be devised, with a view to rendering the tunnel absolutely useless to an enemy in every imaginable contingency."

On the report being referred by the Secretary of State for opinion :

"The Surveyor-General of Ordnance considered that the recommendations of the committee would amply suffice for the object in view. Nothing in his opinion was more obvious than the facility with which the tunnel could be denied to an enemy, by means which no vigilance on his part could prevent or remove.

"The Adjutant-General was strengthened in his conviction that the hour when the tunnel was sanctioned, would be for England a most disastrous one. He maintained that there could be no stronger proof of the existence of danger than the magnitude and elaborate

* Ibid., p. xv.

nature of the precautions recommended by the committee.

"The Channel Tunnel proprietors might be of any and every nationality.

"In spite of all precautions, our end of the tunnel could be seized by a *coup de main*. The improved harbours on the French coast would make a surprise more easy. Surprises during peace were the commonplaces of history. The tunnel would directly tempt invasion—it would be the most unassailable line of communications in the world. The successful invasion of England, with the tunnel in the enemy's hands, would be the permanent ruin of the country. Neither fortifications nor scientific agencies could be trusted. It would be impossible to keep secret any military arrangements connected with mines. The danger of the tunnel would be an increasing one, because as time went on, the precautions would be neglected. Why should a new danger be added to those which already existed? From the commercial aspect, even a shadow of danger would be a heavy balance against any possible advantages. The liability to panics would be increased." *

In April, 1883, a strong committee consisting of five members of the House of Lords and five from the House of Commons was appointed to inquire whether it was expedient that Parliamentary sanction should be given to a submarine communication between England and France, and to consider whether any or what conditions should be imposed by Parliament in the event of such communication being sanctioned.

* Ibid., p. xvi.

The members of the committee were as follows :—

Marquess of Lansdowne (Chairman).	Mr. Baxter.
Earl of Devon.	Mr. Harcourt.
Earl of Camperdown.	Sir Massey Lopes.
Lord Aberdare.	Sir Henry Hussey Vivian.
Lord Shute.	Mr. Arthur Peel.

The committee met sixteen times, and examined forty witnesses, who were asked 5,396 questions, dealing with the subject from every conceivable point of view.

On the 10th July, 1883, the chairman submitted to the committee a draft report which he had prepared recommending that the proposals for a submarine tunnel should not be prohibited on merely political grounds, but should be allowed to proceed subject to the ordinary Parliamentary examination by committees.

On the motion that the draft report proposed by the chairman be read a second time, the committee divided, the figures being four in favour and six against. Draft reports were also submitted by the six dissentient members of the committee, but none of these was found to command a majority of the committee, which briefly recorded the fact that a majority was of opinion that Parliamentary sanction should not be given to a submarine communication between England and France.

With two exceptions, the draft reports prepared by members of the committee were printed with the agreed report, and the very able and exhaustive report prepared by the chairman, is here given in full.

CHANNEL TUNNEL: DRAFT REPORT BY MARQUESS OF LANSDOWNE

1. In conducting the inquiry with which we have been entrusted, we have endeavoured to limit ourselves as strictly as possible to an investigation of the points which we believed to be specially referred to us.

2. We were directed to ascertain whether it was expedient that Parliamentary sanction should be given to a submarine communication between England and France, and to consider whether any or what conditions should be imposed by Parliament in the event of such communication being sanctioned. We do not believe that it is incumbent upon us to report upon the possibility of establishing such a communication, or upon the special engineering features of the schemes which have been lately before the public.

3. The possibility of forming a tunnel under the Channel, as to which we gather that some diversity of opinion exists, could, we apprehend, only be demonstrated by the successful execution of the work.

4. There is, in our opinion, no reason for believing that the interests of this country would suffer if the attempt were to be made and were to result in a failure.

5. The inquiry, limited by these considerations, appears to resolve itself into two parts :

(1) A consideration of the commercial or other advantages which might accrue to this country from the establishment of submarine communication between it and the Continent of Europe.

(2) An examination of the effects which the existence of such communication might have upon the national security.

We have taken a considerable amount of evidence bearing upon both points.

6. With regard to the former, we have endeavoured to ascertain the extent to which a tunnel of the character contemplated by the projectors of the schemes now before the public, would suffice to carry a largely increased amount of traffic.

7. There is a wide discrepancy between the estimates which have been laid before us, as to the carrying capacity of a double line of railway, worked under the peculiar circumstances which will be present in the case of a tunnel line.

8. It is obvious that in the case of a railway running through a tunnel of the altogether unprecedented length of 30 miles, approached by steep gradients at each end, and used for the purpose of carrying goods as well as passengers, extraordinary precautions would be called for; with regard to these we may express our belief that if the formation of the tunnel were to be permitted, it would be found necessary to insist—

(1) That under no circumstances should more than one train be allowed to run at the same time over the 5-mile gradients at each end of the tunnel.*

* 1 in 80 in the original scheme, now 1 in 165 and 1 in 185 respectively, with longer approaches.

(2) That there should be a sufficient number of block stations in the tunnel, and that two of these should always be blocked at once.

(3) That a certain number of hours out of the twenty-four should be set apart for the examination and repair of the permanent way, and for the relief of the block signallers.

The details of these arrangements would, we apprehend, be fully considered and regulated from time to time by the Board of Trade.

9. The adoption of these precautions would necessarily impose certain limits upon the traffic which might be run through the tunnel. That traffic might possibly be still further limited in the event of the ventilation of the tunnel presenting difficulties greater than those foreseen by the promoters. This subject, which we regard as inseparably connected with that of the structure of the work, is not one which we consider to have been referred to us. We have, however, during the course of our inquiries, received several suggestions upon the question, and we may without impropriety point out that the Channel Tunnel will, if made, differ from all existing tunnels in its great length and in the fact that throughout the whole of that length it must necessarily be below the level of both its entrances.

10. Under these circumstances it can scarcely be doubted that the problem of providing adequate ventilation for the tunnel will be one of some difficulty, and we do not doubt that before parliamentary sanction is given to any scheme for submarine communication with France, special attention will be given to the appliances

for securing persons using it from risk or inconvenience caused by a defective supply of respirable air.*

11. The importance of the subject will be obvious when it is remembered, that if the tunnel were constructed, and the expectations of the promoters in regard to its ventilation disappointed, this country might find itself in the position of having incurred certain liabilities (of which we shall speak presently) in connection with the defences of the exit of the tunnel, without obtaining any, or at any rate, adequate compensation in increased facilities of communication.

12. The observations which we have to make upon the probable carrying capacity of the Channel Tunnel are founded upon the assumption that those difficulties which attend its effectual ventilation have been successfully overcome.

13. Subject to this reservation, the evidence leads us to believe that a tunnel of the character of those now projected would be capable of accommodating a very large amount of passenger and goods traffic.

14. Thus Mr. Grierson, general manager of the Great Western Railway, expresses his belief that twelve passenger trains per week-day and two on Sundays, and four goods trains per week-day, carrying 2,316,000 passengers and 375,000 tons of goods per annum, could be run with safety through the tunnel.

15. Mr. Oakley, general manager of the Great Northern Railway, considers that after setting apart a

* Written in 1883 before the introduction of electric traction. Sir Douglas Fox and Partners in paragraph 28 of their Report (see Appendix) state: "There will be no difficulty whatever in dealing with this (ventilation of the Channel Tunnel)—it (the volume of air required) being far less in proportion than we have had to provide elsewhere."

portion of the twenty-four hours for goods traffic, which would be conveyed at a slower rate, an average of four trains per hour might be maintained.

16. Major-General Hutchinson, one of the Railway Inspectors of the Board of Trade, states his opinion that :

" Assuming the speed of passenger trains and goods trains to be respectively 40 and 20 miles an hour, and the number of each to be about equal.

" Assuming also that there are two block stations in the tunnel, and that two sections are blocked to increase the safety of working, twenty-five trains might be passed through in each direction ; or, making the necessary reduction for repairs and renewals of permanent way, about 1,500,000 of passengers and 400,000 tons of goods per annum."

General Hutchinson adds that, " With speeds of 45 and 25 miles an hour for passenger and goods trains respectively, the number of trains, under the same assumption as above as regards block stations, would be thirty-one, capable of conveying about 1,750,000 of passengers and 500,000 tons of goods respectively per annum."

17. Colonel Yolland, the senior Railway Inspector of the Board of Trade, would set apart six hours out of the twenty-four for the maintenance of the permanent way, but states that in his opinion the tunnel could be worked safely with three trains an hour, or from fifty-four to sixty trains in the eighteen hours.*

* This doubles the figures quoted by General Hutchinson. The divergence of view respecting the traffic capacity of the tunnel expressed by eminent authorities is doubtless due to varying estimates of the time-interval required between successive trains, in order to eliminate from the tunnel the noxious fumes given off by steam locomotives before

18. The above estimates are, it will be observed, founded upon the assumption that two lines of rails only are laid in the tunnel; it is, however, highly probable that if the traffic were to expand, a time would come when the number of lines would be increased, and the carrying capacity of the Tunnel proportionately augmented.

19. We have now to consider the extent to which, if railway communication were established between England and the Continent, the traffic between them would be affected.

20. We express with confidence our opinion that it would be reasonable to anticipate an immense development of the passenger traffic.

21. The number of persons now crossing the Channel, is, if we bear in mind the extent to which the population of the British Islands is connected by business and other ties with that of the Continent of Europe, remarkably small. The total passenger traffic between England and the Continent during the year 1882 is represented by a total of 464,000 journeys between English ports and Calais, Boulogne, and Havre, and 50,000 journeys between English and Belgian ports.

22. It is to be remembered that the population of the British Islands is, at the present time, between 35,000,000 and 36,000,000, and that of Belgium, Holland, Germany, and France about 92,000,000;

the passage of a second train. Happily, this problem of ventilation—a very real one at the outset—will be solved by the adoption of electric traction.

The higher speeds obtainable on an electrically operated line; the provision of automatic signalling; and the increased carrying power of the broad gauge would further largely augment the traffic capacity of the tunnel.

while, if the population of the rest of Europe be added to that of the four countries named above, and the population of North America to that of the British Islands, a total of 100,000,000 upon one side of the English Channel and of 300,000,000 upon the other is the result. The fact that with such a population some 250,000 persons only should cross the Channel (for most of the travellers either way make two journeys), establishes, in our opinion, the conclusion that large numbers of persons, who would make the journey for business or pleasure, are deterred from so doing by the inconveniences of the present passage. These inconveniences have, no doubt, been diminished during recent years, with the result of steadily increasing the number of passages recorded.

23. Further improvements in the harbours, and in the vessels used, would, no doubt, lead to a further increase ; but we are of opinion that any route depending upon a sea passage must continue to be to some extent affected by those accidents of wind and weather which at present render the passage of the Channel so distasteful to travellers and which account for the remarkable fluctuations in the number of persons crossing it from time to time.

24. The shortening of the journey between England and the Continent, which would result from the substitution of a train for a packet service between Dover and Calais, would also operate in the direction of increasing the number of passengers. The fact that a large section of the travelling public at present prefer the shorter and much more expensive route by way of Folkestone and Boulogne or Dover and Calais, to the

slightly longer but much cheaper journey by way of Newhaven and Dieppe or Southampton and Havre, shows that travellers are, as a rule, disposed to give the preference to the most convenient rather than to the cheapest route.

25. The amount of the expansion of passenger traffic which might be expected is obviously a matter of pure conjecture. We observe, however, that the witnesses whom we have examined, including several of the most eminent of our railway managers, are unanimous in expressing their belief that it would be very large indeed.

26. Mr. Grierson, the general manager of the Great Western Railway, believes that the present number might be doubled in five or seven years, and trebled in fifteen.

27. Mr. Oakley, of the Great Northern Railway, anticipates that it would be trebled in a year and a half, and would continue to expand.

28. The majority of the witnesses representing commercial interests are confident that the tunnel would be used to an immense extent by persons travelling to and from the Continent on business.

29. We take this opportunity of referring to a scheme submitted to us by Mr. J. Fowler, C.E., for the introduction of a system of steam ferries, by means of which whole trains might be conveyed across the Channel, and thus transferred from English to Continental railway lines and *vice versâ*.

30. It is claimed by Mr. Fowler for his scheme that it would secure for the public the same advantages, in the way of through communication, as those to be

obtained by means of a tunnel route ; that its adoption presents none of the difficulties which present themselves in the way of the latter ; that the expense which it would involve would be materially less ; and that by depending upon it in preference to a tunnel all possibility of additional risk to the country would be avoided.

31. We are unable to express an opinion upon these alleged points of superiority without a special investigation of Mr. Fowler's project. No proposals founded upon it are at present before Parliament, and we do not consider that the fact of such a project having been in Mr. Fowler's contemplation would be of itself sufficient to warrant us in reporting adversely upon the proposal which we have been specially directed to examine.

32. We proceed to consider the effect which the opening of a Channel Tunnel might be expected to produce upon the commerce of this country.

33. With regard to this, we may observe that there is no difference of opinion as to the inconvenience of the existing route for goods traffic. The uncertainty which is inevitable in the case of communications liable to be affected by wind and weather, and interrupted by transfers from the railway truck to the steamer and the steamer to the railway, the delay, expense, and risk involved in transhipment at the ports of embarcation and disembarcation, and the cost of insurance, have all constituted serious hindrances to our international commerce.

34. The trade in certain classes of goods is especially liable to be affected by these causes. Of these the principal are :

(1) Perishable commodities, such as fruit, fish, flowers, vegetables, and other food supplies.

(2) Fragile articles, such as pottery, the lighter sorts of machinery and the more delicate textile fabrics.

(3) All small articles requiring careful packing, and of which the value is great in proportion to their bulk.

35. That the tunnel, if made, would be largely used by goods of these classes we do not doubt.

36. We may refer in support of this anticipation to the evidence of Mr. Slagg, M.P.; of Mr. Oakley, who has furnished us with an interesting enumeration of the commodities for the conveyance of which the tunnel route would probably be used; of Mr. Samuelson, who has described the adverse effects of the existing arrangements upon the trade in agricultural machinery; of Sir Jacob Behrens and Mr. Lee, who have given evidence in favour of the tunnel in the interest of our textile manufactures; and of Mr. Wedgewood, who has pointed out the large saving which would result to the pottery trade by the substitution of through carriage in trucks for conveyance partly by rail and partly by sea to the Continent.

37. There is, however, a large traffic in commodities not falling within these descriptions, which is, nevertheless, carried on under disadvantageous conditions from the causes to which we have referred.

38. In modern commerce, speed and certainty are, as Sir Jacob Behrens has pointed out to us, not less essential than cheapness in cost. The following extract is from his evidence as to the trade in woollen fabrics :—

"4513. Sir Massey Lopes: I understand that the whole of your evidence in favour of the tunnel really depends upon this: that it is a question of rates?—More of speed than of rates, and certainty of delivery. That is the greatest advantage that I expect from it.

"4514. I understood you to say just now that unless you had some security that the rates were not increased for your manufactures as between Bradford and the different towns on the Continent, you would be adverse to the tunnel?—I should not advocate it.

"4515. So that really it is a question of rates?—Yes, but, as I have already said, it is more a question of speed than of rates.

"4516. But still one of your conditions is the rates?—Yes; but it is the secondary one; it is not the highest."

39. We have no reason to doubt the statement made to us by several witnesses to the effect that of recent years it has become unusual for retail traders to retain large stocks, and that the system of ordering commodities as they are required in small quantities at a time from the manufacturers is in consequence of the keenness of commercial competition becoming habitual among the merchants both of this and of other countries.

40. To a trade carried on under these conditions the punctual and rapid execution of orders is all-important.

41. We do not doubt that the delay and irregularity inseparable from carriage by sea in its present condition have operated to the serious disadvantage of English manufacturers and exporters, and that the substitution for the present route of one more rapid, more punctual, and attended by fewer risks and inconveniences, would occasion a large expansion of our trade, and enable it to compete with that of foreign countries under infinitely more favourable conditions.

42. These considerations would, we believe, affect not only those special branches of commerce to which we have referred already, but also the trade in other articles for which, from their cheapness and bulk, carriage by water would naturally present superior attractions.

43. The extent to which this will be the case must remain a matter of conjecture. There are many classes of goods for which it may fairly be presumed that conveyance by sea will always be preferred; where rapid delivery is not an object, where the goods conveyed are not liable to deterioration in transit, the sea route, so long as it remains the cheapest, must continue to hold its own.

44. It is, however, a remarkable fact, that for some time past, both on the Continent of Europe and in America, carriage by rail has competed successfully with carriage by water in cases where both were available, and there is no reason why such competition should not take place in the present instance.

45. The extent to which it will be possible for the tunnel route to compete with the different sea routes across the Channel, must, of course, depend upon the rates at which goods are conveyed over the former, and these charges again must form the subject of future adjustment. The evidence, however, which we have received has satisfied us that even if they were apparently higher than those for conveyance by sea, it would frequently be to the advantage of exporters to submit to them, and to avoid the delays, risks, and expenses incidental to a sea voyage.

46. We may, before leaving the subject of rates, observe that the existence of alternative routes by sea

will, in all probability, have the effect of keeping within reasonable limits the charges made for conveyance by the tunnel route.

47. We cannot doubt that the tunnel, once opened, would not only afford a profitable and expeditious route for the conveyance of a portion of the goods traffic already in existence, but would lead to a large expansion of the trade between this country and the Continent. We share the belief expressed, almost unanimously, by the witnesses who have appeared before us as representatives of various commercial interests in this country, that the introduction of improved facilities for communication between one country, or one district, and another, has invariably led, if not to the creation of new trades and new industries, at all events to a development, often far in excess of the most sanguine expectations, of those already in existence.

48. Such an expansion of trade has followed from the introduction of through rates, and from the removal of interruptions of gauge in this country, and from the establishment of improved communication and the overcoming of physical obstacles on the Continent of Europe and in America; and we have no reason to doubt that it would follow, if the disadvantages occasioned to international commerce by the existence of the English Channel were to be successfully removed.

49. From such a development of the trade between the United Kingdom and the Continent, this country would, it can scarcely be doubted, be the greatest gainer.

50. Owing to the peculiar position which it occupies in the commercial system of the world, it has, we believe, more to gain than any other nation by an

improvement of its trade routes, and more to lose by the neglect of any opportunities which may present themselves for their improvement. The greatest distributor of commodities in the world, it is, above all nations, interested in the improvement of those channels through which that distribution is effected. This consideration is entitled to the greater weight, because the enterprise of our Continental competitors has, by the improvement of Continental harbours and the facilitation of through traffic in goods throughout the Continent, already been successful in threatening our supremacy in the *entrepôt* trade. We desire to express our belief that not the least material of the arguments in favour of the establishment of submarine communication is to be found in the fact that it would probably tend to retain for us a large amount of business which recent changes upon the Continent are already tending, and may still further tend, to divert from our ports.

51. The volume of the trade which would be likely to make use of the Channel Tunnel, were that route opened for the conveyance of goods at rates sufficiently advantageous to induce exporters and importers to make use of it, must, as we have already pointed out, remain a matter of conjecture. It is, however, material to consider the total amount of the trade of which a portion might be attracted to the tunnel, and to ascertain the value of those sections of it which are most likely to be so attracted.

52. We learn from tables which have been prepared for us under the direction of Mr. Giffen, in the Board of Trade, that of the total trade of the United Kingdom,

imports to the value of £151,000,000 come to this country from the Continent of Europe, and exports to the value of £127,000,000 are carried from this country to the Continent. These exports and imports represent about two-fifths of the exports and two-fifths of imports of the United Kingdom to and from the whole world.

53. It is to be observed that, of the above exports, £81,000,000 are British and Irish products (about one-third of the British and Irish products exported from the United Kingdom); while the foreign and colonial produce re-exported from this country to the Continent is valued at £46,000,000, or three-fourths of the total amount of foreign and colonial produce distributed by this country. In addition to the distribution of produce to this amount, it is necessary to take into consideration the business spoken of specially as that of transhipment, which amounts to about £12,500,000 a year, of which £9,500,000, or more than three-fourths, is received from the Continent, while £2,800,000, or about one-fourth, represents commodities sent, after transhipment, to the Continent. Besides these, there is a large but fluctuating trade with the Continent in bullion, and a large traffic in securities. The total of our transactions with the Continent, including imports, exports, transhipment, and bullion, amount, in round numbers, to £300,000,000, or £150,000,000 each way.

54. From other tables which have been put in by Mr. Giffen, in illustration of the movements of shipping, it appears that in 1882 the entries of shipping in the various ports of the United Kingdom from Europe

amounted to 20,000,000 tons, or nearly three-fourths of the total entries from all countries, and the clearances to 18,500,000 tons, or nearly two-thirds of the total clearances to all countries.

55. A fair idea of the total amount of the trade liable to be affected cannot, however, be formed, unless to the figures quoted above be added those representing the trade of the United States and Canada with Europe, excluding the United Kingdom. With regard to this, Mr. Giffen estimates the amount of the imports into the United States from Europe, excluding England, at £32,000,000, and the exports from the United States to Europe, excluding England, at £52,000,000. Adding to these amounts the trade between the United States and Europe in bullion, the total for the year 1881 of the trade between North America and the Continent of Europe may be taken at £100,000,000.

56. The total trade between the Continent of Europe on the one hand, and the United Kingdom and North America on the other, may therefore be set down at £400,000,000 annually, or £200,000,000 each way.

57. With reference to the prospects of the Channel Tunnel, it is important to distinguish the amount of the trade referred to above which belongs to those countries of Western Europe, the commerce of which would be most likely to take advantage of improved communications between England and the Continent. We find accordingly that, of the total of our imports from the whole of Europe, two-thirds, or £98,000,000, were from Germany, Holland, Belgium, and France; while, of our total exports to all Europe, two-thirds, or

£88,000,000 were to these four countries. Of these exports, £50,000,000 were of domestic produce, or five-eighths of our exports of such produce to all Europe, while £38,000,000 were of foreign and colonial produce, or four-fifths of our exports of foreign and colonial produce to all Europe. Of our distributing trade, by far the greater portion is therefore carried on with our nearest Continental neighbours, with whom also we transact a transhipment business represented by £8,000,000 out of £9,500,000 worth of goods imported for transhipment from all Europe; and of exports valued at £2,000,000 out of £2,800,000 exported after transhipment to the whole of Europe.

58. Of the bullion trade nearly the whole imports and the great bulk of the exports are from and to these countries, with which our total annual trade, including imports, exports, transhipment trade, and bullion, amount in round numbers to £200,000,000, or £100,000,000 each way, out of £300,000,000, or £150,000,000 each way, our total trade with all Europe.

59. Of the trade between the Continent of Europe and the United States, nearly the whole belongs to these four countries, the total trade of which with the United Kingdom and the United States may, Mr. Giffen considers, be taken at £300,000,000, or £150,000,000 each way, exclusive of traffic in securities and passengers.

60. The shipping statistics relating to the trade between the United Kingdom and the same group of European countries show that about four-sevenths of the total tonnage, including entrances and clearances to and from all Europe, belong to Germany, Holland, Belgium, and France. A table printed at page 516 of

the Appendix to this Report * illustrates the rapid expansion which has been undergone by our trade with these countries during the last twenty years.

61. The above figures establish conclusively—

(1) That the volume of the traffic at present passing across the seas which separate the British Islands from the Continent of Europe, and consequently liable to be affected by the existence of a Channel tunnel, is enormous.

(2) That a very large proportion of that traffic is between the United Kingdom and those four countries (Germany, Holland, France, and Belgium), our trade with which would presumably be most liable to be so affected.

62. In the face of these facts it may be predicted with confidence that any improvement in the routes followed by so vast a body of trade cannot fail to have far-reaching results in the development of existing traffic and in the creation of new.

63. This view is justified, not only by our knowledge that such an expansion invariably follows upon the improvement of trade communications, but by a consideration of the conditions under which, in the case of the Channel Tunnel, the new route would compete with those already in existence.

64. In this competition the tunnel route would have the advantage which must always belong to through carriage by railway over carriage partly by land and partly by sea, with the inseparable inconveniences of transhipment, break of bulk, and terminal expenses. Those advantages, however, which must in all cases be

* This table is not reproduced here.

considerable, can never be so great as in a case in which, as in that now before us, the mixed route is one of which the sea portion is short and the railway portion long in proportion to the whole length of the distance traversed. In the case of a mixed route, where the converse is true, that is, where the longer portion is by sea and the shorter by rail, the cheapness of the water carriage over the longer distance affords some compensation for the expense and inconvenience of transshipment, etc., at each end. Where, on the other hand, as in the case of the conveyance of goods from an inland manufacturing town in England to their destination on the Continent, of the total distance traversed only a small part is by sea, no such compensation is forthcoming. It follows that the removal of the necessity for transhipment, etc., is relatively far more advantageous in the latter than in the former case, and should in the latter case, have the effect of enabling the relieved route to compete upon favourable terms, not only with those routes with which it was able to compete successfully before, but with other routes extending over a much larger area.

65. The relief of the Channel route from the hindrances which, as we have said, operate so disadvantageously to the commerce which makes use of it, is likely to have this result.

66. In this view we have to take into account the extent of that traffic which Mr. Giffen appropriately describes as the "short ferry traffic" between England and the Continent, in the case of which, owing to the shortness of the distance between the English and the Continental ports, the expenses of transhipment and

break of bulk are not compensated by cheap conveyance over a long mileage by sea.

67. The amount of this traffic is shown in tables which Mr. Giffen has prepared with the object of illustrating the trade between France, Germany, Belgium, and Holland on the one side, and the ports of London, Harwich, Rochester, Dover, Folkestone, Newhaven, Littlehampton, Southampton, and Weymouth.

68. We find that of the total imports to the United Kingdom from those countries, £72,500,000, or about three-quarters, are to these ports.

69. Of the total exports to the United Kingdom from these four countries, £48,500,000, or one-half, are from these ports. Of these exports, £16,000,000 represent British and Irish, and £32,500,000 foreign and colonial products, out of a total of £38,000,000 of foreign and colonial products exported to the four countries. The shipping movements of these ports with the four countries show entries to the extent of nearly 4,000,000 tons, and clearances to the extent of 3,000,000 tons.

70. The tables printed in the Appendix specify the different articles imported and exported at each of the ports in question.*

71. Of the trade shown by the above figures as following the short ferry route across the Channel, there is every reason for expecting that a large share would pass through the tunnel. In all cases except the comparatively insignificant number where the destination of the goods happened to be the seaport at which they were landed, two transhipments would be avoided, and, as we have already pointed out, the shortness of the

* These tables are not reproduced here.

present water transit offers no compensation for its expense and inconvenience. It is remarkable that of the wool now sent from London to France, about half is at present carried by rail from London to the Channel ports.

72. We desire to insist particularly upon the importance, in the interests of the large depôt trade carried on by this country, of neglecting no opportunity which may present itself for the improvement of our trade communications. The figures which we have given show how large a part of the foreign and colonial produce which we import is re-exported to Germany, Holland, Belgium, and France, and that of this a large part follows the short sea route. The evidence which we have received shows that this trade is threatened by the increase of business at places like Antwerp, Havre, and Rotterdam, which are able to receive and distribute directly goods destined to the Continent. The fact that the chief manufacturing places on the Continent with which our business in the distribution of raw material is carried on are situated inland, would render it possible for direct railway carriage from this country to compete under favourable conditions with railway carriage between the same places and the continental ports.

73. We are led at this point to the consideration of the effects which the opening of a tunnel under the English Channel might produce upon our security as a nation.

74. Our examination of this part of the subject has been much facilitated by a study of the memoranda and evidence printed in the Blue Book, entitled "Correspondence with reference to the proposed Construction

of a Channel Tunnel." Among these papers we may refer specially to the Report of the Military Committee presided over by Sir A. Alison, and to the minutes of His Royal Highness the Commander-in-Chief, and of Lord Wolseley.

75. These papers contain a very full statement of the military arguments. We have, however, thought it desirable to afford the writers an opportunity of further explaining their views, and of submitting themselves to examination with regard to the data upon which they had founded their conclusions, and we have supplemented their evidence by that of other distinguished officers.

76. We share with the military witnesses their opinion that the existence of a tunnel under the Channel would in some respects modify the conditions under which the defence of this country would have to be undertaken, and that special precautions would be necessary in order to prevent the possibility of its falling into the hands of an enemy. We agree with them in believing that its possession, either during the progress of operations or during an occupation of English soil, would be highly advantageous to the invading force, and possibly disastrous to the invaded nation. Such a force holding both ends of the tunnel would have a secure line of communications by means of which it could be safely and easily provided with supplies and reinforcements ; these, without a tunnel, could be conveyed by sea only, subject to all the risks of transport across the Channel and attack from the English navy.

77. We are, therefore, ready to concede that if it can be shown that no means could be devised upon

which reliance could be placed for preventing a tunnel, once made, from passing into the hands of an enemy, its formation would be in the highest degree objectionable.

78. We have, therefore, to consider whether the capture of the tunnel by an enemy is a contingency so probable as to justify us in recommending that its construction be forbidden by Parliament.

79. We avail ourselves of this opportunity for expressing the reluctance which, as civilians, we feel to express our own opinions, and especially to criticise those of high military authorities, in regard to matters affecting the defences of the country. We cannot, however, divest ourselves of the responsibility which Parliament has thrown upon us in entrusting us with this inquiry. It is, moreover, our duty to point out, and upon this we shall have more to say presently, that of the considerations on which those military authorities have relied in arriving at their conclusions, many are far from being of an exclusively technical or military character. Some of them, indeed, are purely political, and upon these, at any rate, we conceive that we need have no scruple in expressing the opinions which we have been able to form. In other cases, again, the statements originally put forward have been so far qualified or limited by the subsequent evidence of the witness as to deprive them of much of their significance and weight.

80. We have already admitted that the existence of the tunnel would to some extent alter the conditions under which this country would have to be defended against attack. It follows, and, to the best of our belief,

no one has disputed the conclusion, that steps must be taken with the object of removing the risk which, if no such steps were to be taken, the presence of the tunnel would involve.

81. This question has been so thoroughly dealt with by the Military Committee, presided over by Sir A. Alison, to which its investigation was entrusted last year, that it is not necessary for us to do more than recapitulate the principal recommendations of their Report. The evidence which we have taken in connection with this branch of the inquiry leads us to believe that those recommendations are regarded by the military authorities as embodying the most effectual measures which military and engineering science is able to suggest for the purpose of securing the tunnel.

82. We will, therefore, assume that in accordance with the suggestions of the committee, arrangements have been made :

(1) For protecting the mouth of the tunnel by means of a portcullis or other defensible barrier.

> We desire to invite attention to the suggestion made by Sir F. Bramwell for the defence of the terminal station at the English end of the tunnel by means of massive sliding gates connected by inter-locking machinery, the machinery to be so arranged that both gates could never be opened at the same time.

(2) For interrupting the ventilation of the tunnel, and thereby rendering its air irrespirable.

(3) For closing the land portion of the tunnel, by pouring shingle into it at one or more places specially provided for the purpose.

(4) For the temporary demolition of the land portion of the tunnel by mines, or by fixing charges of explosives.

(5) For partially flooding the tunnel by opening of sluice valves, or by the use of explosives.

(6) For the complete destruction of the tunnel by the admission of the sea.

With regard to the last, we observe that several of the witnesses whom we have examined have expressed themselves incredulous as to the possibility of effecting such a breach in the roof or walls of the tunnel as would have the effect of permanently disabling it. We have, however, ascertained that the members of the Military Committee thoroughly considered this question, and we obtained from Sir F. Abel and Colonel Majendie, the two members of the committee who were specially consulted upon these points, a clear expression of their opinion that by the use of explosives the tunnel might be disabled to such an extent that its restoration would be an operation not less serious than the construction of a new tunnel.

83. We further assume that, in accordance with the recommendations of the Military Committee, the tunnel has been made to emerge in the immediate vicinity of a suitable fortress, and that the arrangements to be used for its obstruction are to be controlled from different points situated within the works of that fortress, as well as from other points at a distance from it.

84. The character and extent of the additions which would be requisite in order to bring the works now in existence at Dover up to the strength necessary under the altered circumstances which would be present

are matters upon which we cannot undertake to report in detail. These must be determined upon the responsibility of Her Majesty's Government, aided by their professional advisers. His Royal Highness the Commander-in-Chief has pointed out to us that it would be impossible for these to give an opinion until the precise position of the tunnel and its exit has been determined.

85. We observe that upon these points, and particularly with regard to the strength of the garrison which would be necessary, there is some discrepancy in the opinions of the military witnesses.

86. Thus, His Royal Highness the Commander-in-Chief states that the force at Dover should always be of a minimum strength of from 8,000 to 10,000 men.

87. Sir A. Clarke, Inspector-General of Fortifications, would wish the peace garrison of Dover, which now numbers about 3,000 men, to be increased to 6,000, but adds that he considers that increase desirable, "tunnel or no tunnel," This witness considers that a redistribution of troops would provide the extra 3,000 necessary.

88. Sir Lintorn Simmons believes that an extra garrison of 10,000 men would be required.

89. General Lord Wolseley is of opinion that the present garrison should be raised to a strength of from 10,000 to 12,000 men.

90. We understand that the accommodation now in existence at Dover is sufficient for 3,000, and that in time of war a force of from 6,000 to 8,000 men would probably be placed within the works.

91. With regard to the possibility of strengthening

the Dover force upon an emergency, we may mention that the distances by rail between Dover and other places where troops are, are the following :—

	Miles.	Ch.
Dover to Canterbury	16	34
" Chatham	43	75
" Woolwich	67	42
" London	76	46
" Shorncliffe	7	27
" Aldershot	95	22

92. We have now to examine *seriatim* the principal apprehensions for the safety of the tunnel which have been expressed before us. These are to the effect that it might pass into the hands of an enemy :

(1) by surprise, effected through the tunnel itself ;

(2) by surprise, effected by a force landed in the neighbourhood of the tunnel, with or without the aid of troops passed through the tunnel ;

(3) by surprise, facilitated by treachery ;

(4) after investment by an invading force ;

(5) by cession as a condition of a disastrous peace.

93. We desire to call especial attention to the fact that it is assumed, and notably by Lord Wolseley in his published Memorandum, that the danger to be apprehended from a *coup de main* of the kind suggested in (1) (2), and (3), would be greatest at a time when this country was in a state of profound peace with all the world, including the Power by which the supposed *coup de main* might be struck. " The seizing of the tunnel by a *coup de main* is, in my opinion," says his Lordship, " a very simple operation, *provided it be*

done without any previous warning or intimation whatever by those who wish to invade the country." Speaking of the risk of surprise from a force sent through the tunnel, the same writer (Mem. p. 282) says: "My contention is, that were a tunnel made, England, as a nation, could be destroyed *without any warning whatever, when Europe was in a condition of profound peace* . . . the whole plan is based upon the assumption of its being carried out *during a time of profound peace between the two nations*, and whilst we were enjoying life in the security and unsuspicion of a fool's paradise."

94. We gather from Lord Wolseley's evidence before this committee, that it is far from his Lordship's intention to suggest by the above expression that there is a greater probability of this country being treacherously attacked during a time of the profoundest peace, than at a moment when our foreign relations might be such as to require more than ordinary vigilance. It is, however, undoubtedly the opinion of Lord Wolseley, and of others who have addressed themselves to the study of this question, that a treacherous attack directed against us by an apparently friendly Power, at a moment when all the political circumstances were such as to disarm the suspicions of the political and military authorities is the particular form of danger which it is most of all our duty to anticipate, as one of the results of the opening of a submarine route between England and the Continent.

95. In support of this view a Paper, with which we have been supplied, has been prepared by the direction of His Royal Highness the Commander-in-Chief in the Intelligence Branch of the War Department. That Paper has for its title *Hostilities without Declaration*

of War, and the writer has undertaken to show by a review of over a hundred cases, selected from the history of this and the last century, that hostilities between European Powers have, with rare exceptions, commenced without previous declarations of war. That this has been the case, in so far as hostile acts have been committed by land or by sea without the formal announcement that peaceful relations were to be considered at an end, we do not doubt. There is, however, a wide distinction between acts of hostility committed without a formal declaration of war, and such acts committed under circumstances rendering it impossible for the Power attacked to foresee the danger which threatened it. An examination of the Paper referred to will show that in the large majority of the cases referred to in the Paper of the Intelligence Department, hostilities, though not preceded by formal warning addressed to the Power against which they were directed, nevertheless took place at times when, owing to international complications, the continuance of a state of peace could not have been expected. The cases selected by Lord Wolseley for the purpose of illustrating his argument do not appear to bear it out. These were: 1st. The seizure in 1807 of the Danish Fleet at Copenhagen; 2nd. The capture in 1804 of four Spanish frigates; 3rd. The sudden and unexpected outbreak in 1870 of the Franco-German War.

1st. The Danish Fleet was, it is true, seized without a previous declaration of war; a proceeding due to and justified by the discovery by the English Government of the secret article in the Treaty of Tilsit, by which the Navy of Denmark had been

put at the disposal of France ; an act which, it is needless to say, constituted an alliance with our enemies, and which the Danish king and Government must have known to be tantamount to a declaration of war, with all its consequences, for which they ought to have been prepared.

2nd. The seizure of the Spanish frigates was made (in accordance with a practice which was frequent in the eighteenth century, and was supported by jurists of all countries) on the eve of a war with France, felt to be inevitable, and in which Spain, by her treaty engagements with France, would be necessarily involved ; and was, in fact, the sequel of a long and angry diplomatic correspondence, during which Spain was making active preparations for a maritime war.

3rd. The Franco-German War broke out with unexpected rapidity, but not so suddenly that either party possessing a single weak point, like the Channel Tunnel, would not have had ample time to place all its defences in working order.*

96. We do not take the view that the contingency of a *coup de main* struck by a Power with whom our relations had been friendly and unstrained, is one which we have any right, or which experience would justify us in placing amongst the foremost of the probabilities with which we have to deal. It is our impression, on the contrary, that, if such an attack were to be made, it would be preceded by circumstances which would have

* To illustrate this point, it may be mentioned that the Germans blew up their half of the international bridge at Strasbourg on the outbreak of war.

called for effectual precautions against surprise. We observe with pleasure that this view is that apparently entertained by His Royal Highness the Commander-in-Chief, and by Sir Lintorn Simmons.

97. We are glad to learn from the whole of the military witnesses who have come before us that, if such precautions were in existence, the risk of a successful surprise would be extremely remote. That this would be so, whether the attempt were made by means of a force sent through the tunnel, or by one landed in its vicinity there can be little doubt. A small body of men emerging from the mouth of the tunnel in the face of the concentrated fire of the forts by which it would be commanded, and of the superior force by which it would unquestionably be encountered, if its arrival were expected, could scarcely escape annihilation.

98. Thus, Lord Wolseley says that, if sufficient notice were to be given, "50 men at the entrance of the tunnel can prevent an army of 100,000 men coming through it."

99. Sir A. Alison, referring to the probability of an attack through the tunnel, says that he thinks such an attack "ought to be very easily met"; and adds, "if there was any alarm at all, or any strainedness of relations, the precautions to be taken to meet it are so very simple, that I am not inclined to fear it as much as I know many military men of great experience do."

100. Nor would a like attempt on the part of a moderate-sized force, suddenly landed in or near Dover, if such an attempt were foreseen by the defenders, probably be less unsuccessful.

101. Sir A. Alison, questioned upon the prospects

with which such an attempt might be made, says, "It is only in time of peace that it could be done, without a formal declaration of war, and when it is not expected."

102. Lord Wolseley, asked whether he had any apprehension as to the result of an attempt of the same kind made at a time when we were at war, and when consequently the force to whom the defence of Dover was committed, would be in daily or hourly expectation of hostilities, replied that, "With a garrison at Dover of 10,000 or 12,000, commanded by a well-selected general, a surprise would be a very improbable event."

103. His Royal Highness the Commander-in-Chief, asked whether he would anticipate much danger from the tunnel in time of actual war, replies, "I should think the danger from the tunnel is before any war breaks out; that is the point where I consider there is the greatest risk."

104. The military evidence indeed points throughout to the conclusion that the risk from a *coup de main*, unless struck in time of the profoundest peace, would be scarcely appreciable. We have already expressed our opinion with regard to the probability of an attack of this kind being made under such political conditions. It is, however, desirable, before we leave this part of the subject, to examine the prospects with which a *coup de main* might be attempted, even upon the assumption that the attempt took place when we had no reason whatever for anticipating it, and when the political sky was absolutely clear.

105. If the *coup de main* were struck through the tunnel the invaders would have to be entrained without attracting attention, and sent through the tunnel without

such a disturbance of the ordinary traffic, as might awaken suspicion on our side. They would have to debouch from the tunnel in sufficient numbers, and with sufficient rapidity, to enable them to possess themselves at once, and simultaneously, of the different works commanding the exit of the tunnel. They would have to hold the exit and these works against any attempt which might be made to recapture them. Finally, unless we are to assume the failure of the whole of the arrangements suggested for closing the tunnel in case of need, they would have to possess themselves at once of all the points from which those arrangements would be controlled, at the risk of finding the tunnel obstructed in their rear, and their retreat hopelessly cut off before reinforcements or supplies could possibly reach them.

106. This being so, we are not surprised to learn from His Royal Highness the Commander-in-Chief that in his opinion if there is any risk from a *coup de main* " it is seaward that there is the danger ; not the tunnel as a means of attack."

107. With regard to the possibility of seizing the English end of the tunnel by means of a small force landed in its neighbourhood, we have endeavoured to ascertain precisely the conditions, of which the presence would be indispensable if such an attempt were to have any chance of success. Those conditions would, we understand, be the following :—

(1) It would be necessary that the invading force should be despatched with absolute secrecy.

(2) That it should cross the Channel unobserved and unmolested by our fleet.

(3) That the state of the weather should offer no difficulties to the disembarcation.

(4) That its landing should be effected without hindrance.

(5) That it should advance without molestation from the point at which it might be landed to the works by which the exit of the tunnel would be protected.

(6) That it should find the garrison in a state of absolute unpreparedness.

(7) That it should succeed in carrying by a simultaneous rush the whole of the various works surrounding the exit of the tunnel.

(8) That this capture should be effected so rapidly as to render it impossible for the defenders of those works to have recourse to any of the means which would be in existence for the purpose of closing or destroying the tunnel, *or*, that the whole of those means should simultaneously chance to be out of working order.

108. That every one of these conditions should be present at the same time it appears to us most improbable. We can well conceive that, with the rapid communications now available for the movement of troops by land or sea, a force such as that contemplated might be collected and despatched, and possibly reach our coasts without warning. That its landing, formation, and forward movement could altogether escape detection we can scarcely conceive. It would, we learn from Admiral Rice, take twelve hours, even under the most favourable conditions, and assuming the landing to be unresisted, to land 20,000 men, the force

contemplated by Sir Lintorn Simmons. Such a force could not, however, in Admiral Rice's opinion, be landed without attracting attention. A smaller body could, of course, be landed with greater rapidity, but the diminution of its numbers would not increase its chance of success. A force of 1,000 men could, Sir Cooper Key informs us, be landed under favourable circumstances in an hour ; " the larger the number of men," however, this witness adds, " the more the difficulties that would arise against the time, but I have no hesitation in saying, that if they were equipped for it, with boats properly prepared, and a good clear beach, they could land 10,000 men under ten hours."

109. That such a force, or one approaching to it in strength, should be able to traverse without detection or hindrance, the distance intervening between the point of landing and the exit of the tunnel, which, unless the recommendations of the Military Committee are altogether disregarded, would be at a considerable distance from the shore, appears to us difficult to conceive ; were it to be detected, and the alarm given, the complete surprise of the garrisons of the different forts would no longer be possible.

110. The apprehension of Lord Wolseley, is, however, not that the invading force should be landed on the coast to the east or the west of Dover, upon which we understand that the nearest points available for a landing are at a distance of several miles from the town, but that a force much smaller than that supposed by Sir L. Simmons, and probably numbering not more than 3,000, might arrive at night at Dover itself. The anticipated operations of such a force are graphically

described by Lord Wolseley in his evidence, from which the following extracts are taken. The landing might, his Lordship supposes, have taken place at Dover Pier.

"4946. What distance would the force have to traverse before it got to the works ?—There are no works at Dover, distant from the quay, more than a mile and a half or two miles ; I never calculated the exact number of yards.

"4947. At any rate that distance, which is probably something of that kind, would have to be traversed ?—That distance would have to be traversed.

"4948. And its course lies through the town of Dover ?—Its course lies through all the various parts of the town of Dover.

"4949. At this moment you suppose that a force so landed would first awaken the alarm of somebody or other at Dover ?—If the surprise were properly carried out, I do not see how anybody is to know anything about its taking place ; if it is carried out on a dark or a rainy night, I do not see how anybody is to know anything about it before you actually walk up to the barrack gate and ask the sentry to let you in.

* * * *

"4951. You assume, not that the works are carried by what you have called a short siege, but a sudden rush ?—By surprise. If you had to resort to a siege, and you had the means of blowing up the tunnel, of course you could blow it up.

"4952. With regard to the works, we civilians cannot tell what works might or might not be erected in order to protect the tunnel, but at this moment there are works, are there not, upon either side of the town of Dover ?—Yes, on either side of the valley.

"4953. What is your idea ; that a force landed in the way which you have suggested would carry the whole of those works, or only that it should devote itself entirely to the works upon one side of the valley ?—I should think they ought to carry all the works.

" 4954. Fort Burgoyne on one side and the Citadel on the other ?—Fort Burgoyne on one side, and the Citadel on the other and the Western Heights. I forget the names of the various forts ; there are about four principal works in Dover, as well as I remember.

* * * *

" 4963. Then no alarm would be given by the appearance of 6,000 or 7,000 men through the streets of Dover in the dead of night ?—I was talking of 3,000 men, but if you take it up to 6,000 men, they would not march in one column, but march in many different directions towards the defence works which they had to attack ; and if proper precautions had been taken beforehand by the general or the commander who had to devise such a scheme for the surprise of the place, under those circumstances it would be utterly impossible for any alarm to be given to the garrisons of the different works about to be attacked. It is quite possible that people, for instance, the policemen and the coastguardsmen on the quay, would be knocked down, very likely bayonetted, or made prisoners, and you may call that giving an alarm ; or they might be perceived landing by a small number of people, and it is possible that on the route from the quay, or from the place of disembarkation, to the various points to be attacked, individuals might come out in the dead of the night for some reason, or they might look out of the windows and see the men marching past ; but if proper precautions be taken, as they would be in case of a surprise being planned and devised by a man who knew his work, I think it would be impossible for any news to reach the different points about to be attacked." *

* * * *

" 5233. I think you said that supposing any one in this room were to go to the barrack gates, and to knock at the door, the door would at once be opened ?—The wicket would be opened to you.

* Telephones were not in general use at that time, the first exchanges in England only having been opened in 1881, about two years earlier.

" 5234. Would it be the case if a person who went there had 100 men in his company?—The man inside would not know that he had them; he would never suspect 100 men being outside; but I would go further and say, even supposing that he would not open the barrack gates, the barrack gates are very easily knocked in.

" 5235. Are there any drawbridges there?—There are, but they are very seldom, if ever, drawn up in Dover.

" 5236. You said that if the tunnel were in existence, it would be necessary that the conditions of life in Dover should be altered; would that be one of the conditions which would be altered?—Yes.

" 5237. And the drawbridges would be up at night?—The drawbridges would be up at night, and nobody would be allowed to go in or out after a certain hour."

111. The following extracts from the evidence of Sir Patrick Macdougall, show that the precautions which might be necessary in order to guard effectually against a nocturnal surprise, would be of the simplest character:

" 5288. In the greater part of the evidence you have given, you have contemplated the case of sufficient notice having reached the defensive force to occupy the lines which you say command the mouth of the tunnel, and even to bring up troops, but the most dangerous contingency that has been suggested is a sudden surprise before those operations could be effected; can you not conceive a sudden surprise of that kind before due notice could be given of the attack?—No, I cannot.

" 5289. It has been suggested that there might be nothing to prevent, even after the works considered necessary for the defence of the tunnel had been completed, a small force landing in the dead of the night at the pier of Dover, and portions of that force reaching each of the fortresses simultaneously, and occupying each of them without material difficulty; can you

conceive of that taking place ?—No, I cannot conceive of its taking place unless there was no garrison in the fort, or that they were asleep.

" 5290. At any time in the night, I presume, when no danger was immediately at hand, a large portion of the garrison would be asleep ?—Yes.

" 5291. A certain portion would be on guard ?—Yes.

" 5292. Now, it has been supposed that a force, we will say of 1,000 men, would be despatched simultaneously to each of five or six fortresses, and would arrive at each fortress at the same time ; that they would knock at the door, and be admitted, and would rush in and disarm the ten or twelve men who would be on guard ; does that attempt appear to you to be a feasible one ?—It might be feasible on the supposition that the drawbridges were down, and the wickets open, but not upon the supposition that the drawbridges were up.

" 5293. I presume if any summons came at night to the soldier on guard, he would endeavour to ascertain who it was ; he would not open the door without some precaution ?—Of course the supposition is, that the wicket is opened to admit a supposed friend, and then these people rush in ; but that would be rendered impossible by the drawbridge being up, and if the drawbridge were up, 4,000 men could do nothing against a fort with a steep escarpment ; they could not scale the walls.

" 5294 I presume that if Dover became, as it would become in the case of the tunnel being made, a place of some importance, every possible precaution against a sudden rush of that sort would be taken ?—I should suppose so.

" 5295. Can you conceive that those precautions might be made, not very expensive and perfectly certain of acting ; precautions to prevent the fort being seized suddenly and without due notice, so as to rouse the garrison ?—I do not think they could possibly surprise the fort if the drawbridge was up, and the garrison within. I am supposing small garrisons, not a large

division. I think garrisons of 500 men would be ample for these small detached forts. The forts now existing require larger garrisons in proportion to the small forts, but then they are constructed for a different purpose."

112. We desire to dwell, in examining this part of the subject, not only upon the difficulties which the force by which a *coup de main* might be attempted would have to surmount before it could possess itself of the tunnel and the protecting works, but also upon what appears to us to be the certainty, that even if it was successful in effecting its purpose to this extent, it would, under the arrangements advocated by the Military Committee, find the tunnel disabled.

113. Of the measures enumerated in the Report of the Military Committee which, as we have pointed out, would produce results ranging between a temporary destruction of the tunnel and its permanent annihilation, some would, we cannot doubt, have been resorted to from the moment that it became evident that an attack of any kind was impending. Those selected would, if the attack did not promise to be formidable in the first instance, effect a stoppage, which could be easily removed when the danger had ceased to exist. The flooding of the lowest lying portions of the tunnel, the closing of the barriers at its entrance, the discontinuance of the means for supplying it with respirable air, would be sufficient for this purpose. A more formidable attack might be at once followed by the destruction of the ventilating machinery, or by the demolition of a considerable part of the land portion of the tunnel by means of explosives.

114. By these means the tunnel would be rendered useless for a period the length of which would vary according as one or other of the above measures might be resorted to, during which a small force, even if it should have succeeded in possessing itself of the exit, and perhaps of an outwork in the immediate neighbourhood, could scarcely hope to hold its own against the forces which would be brought against it by land, and which, unless the command of the Channel had passed out of our hands, a contingency which we shall discuss hereafter, would threaten its communications by sea.

115. Should this be the case, it would follow, first, that the tunnel itself would no longer be available for the object which *ex hypothesi* rendered its possession desirable to the invaders; and, secondly, that the invaders would find themselves in a position so critical as to be almost desperate.

116. Sir A. Alison states that in such a case the invading force would be in a position of greatest danger; it would be thrown forward at the risk of total destruction; if it failed it would be absolutely lost; and Lord Wolseley adds that it would be unnecessary for it to bring supplies, for the reason that, if it failed, it would not want any.

117. With regard to this contingency, we observe that the military witnesses, while prepared to admit that the consequences which would follow from the timely destruction of the tunnel under the circumstances which we have supposed, are generally apprehensive that the tunnel would either not be closed at all, or would be closed too late, owing—

(1) To the failure of the mechanical contrivances for closing; or

(2) To the reluctance of the authorities, civil or military, to incur the responsibility of such a step.

118. We are quite ready to admit the unwisdom of placing implicit reliance, where great national interests are at stake, upon the absolute efficiency of any human appliances, particularly if it should be the case that those appliances are specially liable to failure from their complication, or from the materials upon which they depend. In this view we are able to express our concurrence in the paragraph with which the Military Committee have concluded their report, and which, considering the terms in which they were entrusted with their inquiry, they could not with propriety have omitted.

119. We share the opinion of the Military Committee that it is impossible to eliminate the risk of failure "in every imaginable contingency," but we believe none the less that it is possible, by the exercise of an amount of care which, judging from the importance attached by the military authorities to these questions, we cannot doubt would be exercised, and by the multiplication of those defensive arrangements upon which the security of the tunnel would depend, so far to minimise any risks which its existence might occasion as to place the occurrence of an appreciable danger beyond the range of those probabilities for which it would be our duty to provide.

120. In connection with this part of the inquiry we have obtained valuable evidence from Sir Frederick

Abel, and from Colonel Majendie, Her Majesty's Chief Inspectors of Explosives.

121. The evidence of the former of these witnesses is to the effect that there are several methods by which the tunnel could be flooded or otherwise obstructed without difficulty; that it might, if desired, be permanently disabled; that "a very simple system of inspection," such as is now exercised at our submarine mining stations, could be easily organised, and would have the effect of "guarding with almost absolute certainty," against risk arising from the deterioration of the appliances made use of. Those appliances are, Sir Frederick Abel admits, no doubt individually fallible, but their sufficient multiplication would reduce the chance of failure to "a very remote contingency." His decided view is that if it was desirable to utterly destroy the tunnel, nothing but very gross and culpable negligence upon the part of those entrusted with its defences would prevent its destruction from being carried out.

122. Colonel Majendie states that "there are any number of ways of obstructing the tunnel; "there is no difficulty about that; if you have warning, and you want simply to close the tunnel, or temporarily to disable it, or to deny it to an enemy, there could be no difficulty in multiplying means which would be perfectly effectual. . . . I have no anxiety at all about that." With regard to the possibility of its permanent destruction, he expresses his belief that with "full time, full warning and full means," there would be no difficulty in destroying it in various ways. He points out that there would be some risk of the mechanical

arrangements getting out of order ; he is apprehensive that those arrangements might not always be maintained in a high state of efficiency, and he adds that " there is always a risk of failure even in a thing which you imagine at the moment is all right." In answer to a subsequent question upon the same point, he observes : " I have always had very much before my mind the recommendation which our committee made, that any means of destroying the tunnel should be controlled not only from the central works of the fortress, but also from one or two distant places ; and it is more with reference to those operations, when, if I may say so, the worst has come, and the enemy are in possession of the tunnel, and possibly of some of its defences, that then, when it is most necessary that the thing should act, I am somewhat apprehensive of failure." Such a failure would not, however, in Colonel Majendie's opinion, be irreparable so long as " we had control of the mine," and " access to the explosives," and if the defences of the tunnel were sufficiently strong to guard against the possibility of sudden seizure, his fundamental anxiety disappears.

123. The evidence of these and other witnesses leads us to believe that by a multiplication of the arrangements for closing the tunnel, by a proper selection of the places from which those arrangements would be controlled, and by the exercise of ordinary care in their maintenance and supervision, the risk of their failure might be reduced to such an extent as to justify us in assuming that such a failure would not, under any conceivable circumstances, be likely to occur.

124. The argument founded upon the assumed

reluctance of the authorities, civil or military, to destroy or to interfere with a work so valuable as the Channel Tunnel is one which we cannot admit to have the force attributed to it. It will be remembered that the means at their disposal would range from the mere closing of the mouth of the tunnel by a temporary obstruction, up to its permanent destruction by the admission of the waters of the sea through an irreparable breach. The former of these precautions would suffice in the case of an attack by *coup de main ;* we cannot believe that upon an emergency, believed by the military authorities to threaten the existence of the nation, it would not be resorted to. The latter could be reserved for the more serious contingency to which we shall presently refer.

125. With regard to the anticipation that the capture of the tunnel might be facilitated by treachery, it is perhaps sufficient to observe that happily the records of this country afford little support for such a conjecture, and that if the existence of treachery be assumed, it would have to operate over an area so extensive as to render its success far from probable. The extent and number of the defences of the tunnel would render the simultaneous betrayal of the whole difficult, even upon the assumption that their position and character had been previously made known to an enemy.

126. To sum up the results of this portion of our inquiry, we desire to state that the apprehensions which have been urged by most of the witnesses whose evidence we have had the advantage of hearing, appear to be founded upon the following assumptions :

(1) A willingness on the part of the Power in possession of the French end of the tunnel to attack this country treacherously, at a moment when our international relations could afford no indication of the imminence of such an attack.

(2) The passage and advance of an invading force, under circumstances which would enable it to elude notice from the time of its despatch up to the moment of its arrival at the Dover works.

(3) The simultaneous seizure by surprise of the whole of those works.

(4) The success of this enterprise with such rapidity and completeness as to render it impossible for the defenders to put into operation any of the manifold appliances for the destruction or temporary disabling of the tunnel.

(5) The neglect, on the part of the military authorities, of all the most obvious precautions for the safety of a place which, according to their own representation, would be of cardinal importance to the security of the nation.

(6) The inopportune interference of the political authorities in a matter concerning the defences of the country.

The presence of most of these conditions, regarded separately, appears to us highly improbable. That the whole of them should concur, we believe to be so nearly inconceivable as to justify us in dismissing from our minds any apprehensions founded upon such an hypothesis.

127. The foregoing considerations have had reference mainly to that particular form of danger which we

understood, from the evidence of His Royal Highness the Commander-in-Chief and the Adjutant-General to be chiefly feared by the military authorities.

128. It is, however, necessary to refer to another contingency: the possibility of the tunnel falling into the hands of an enemy after the reduction of its defences, or after their cession, consequent upon a reverse or a series of reverses sustained in any part of the world by our arms. We fully recognise that, considering the extent of the British Empire, the responsibilities which we have incurred in different parts of the globe, the degree in which we depend upon our naval superiority for the protection of our national interests, the recent growth of foreign navies, and the impossibility of foreseeing the political combinations which may hereafter arise, or the effects of the discoveries of modern science as applied to warfare, we should not be justified in excluding from our contemplation the consequences which might result to this country, were it to sustain an overwhelming disaster after it had been united by a submarine communication with the Continent of Europe.

129. We are further bound to admit that the conditions under which a victorious enemy would enter upon the occupation of this country, or might impose terms of peace upon her if defeated, would be highly favourable to him, and unfavourable to us, if he should be either in actual possession of both ends of the tunnel, or able to exact from us the cession of the English end.

130. It has been urged that in such an event his communications would be easy and almost indestructible, his fleet, instead of being engaged in protecting

his communications, and in guarding the conveyance of his supplies and reinforcements, would be at liberty to blockade our ports and molest our commerce; that he would be able at any moment to pour into this country large bodies of troops; that our difficulty in dislodging him would, under such circumstances, be infinitely greater than it would be were he to establish himself on English soil without the advantages which he would derive from the presence of the tunnel. These sinister possibilities would, it is argued on the one hand, afford greatly increased temptations to an intending invader, and would, upon the other, lead to the recurrence of panics, to commercial and international susceptibilities, and consequently to augmented expenditure upon military objects, and ultimately to the introduction into this country of military service under the conditions prevalent upon the Continent of Europe.

131. We have given our careful attention to these grave considerations, and we should regret extremely to present the appearance of passing lightly over them. We are, however, in the first place, unable to share the anticipation that a victorious enemy would, after lengthened operations, either against the fortress of Dover, or against our forces in any other part of the world, find the tunnel still available for his use. Under such circumstances there would obviously be ample time for its destruction. "If it is a question of siege," says Lord Wolseley, "whether there are contrivances or not beforehand for the destruction of the tunnel, the officer commanding the garrison would improvise such means as to destroy the tunnel during the siege."

132. We cannot bring ourselves to believe that if

our fate as a nation depended upon the accomplishment of this, our rulers would refuse to give the necessary orders, or our military authorities to give effect to them. If we are right, it follows that the conquerors would not, in the event which we have supposed, obtain, and could not expect to obtain, in consequence of the construction of the Channel Tunnel, any advantages such as those which it is imagined that they will derive from its existence. The realisation of this will, we believe, go far to allay those fears, the recurrence of which has been so much apprehended by some of the witnesses.

133. We cannot, however, in reviewing this part of the argument against the construction of the tunnel, abstain from pointing out that, if it be once granted that this country has sustained a reverse so overwhelming as to oblige her to submit to the terms of a peace dictated by a victorious enemy, the presence of the tunnel, even if it were to remain intact, would not materially alter a position already assumed to be desperate.

134. It would, we conclude, be a condition precedent to such reverse, that we had entirely lost the control of the sea, and that our armies had sustained a crushing defeat. It might be fairly contended that, under such circumstances, the victors being absolute masters of the English Channel, would be able to bring across it, without hindrance, whatever supplies and reinforcements they might need for the subjection of this country. There would indeed, were our case so desperate as it is assumed to be, be nothing to prevent a victorious enemy from exacting the cession of the whole of our fleet and of our dockyards, and the demolition of our national

defences, except such as he might himself retain. Finally, amongst the conditions imposed, it is conceivable that one might be the construction of the tunnel at our expense, and its cession to the invaders.

135. We have now, however imperfectly, reviewed the chief arguments to which we have had the advantage of listening in regard to the military aspects of this question. We have in the earlier part of our Report expressed our conviction that the commercial advantages likely to result from the opening of a tunnel under the Channel are likely to be very considerable, and may probably far exceed the most sanguine expectations formed with regard to them. We are of opinion that a great industrial enterprise, offering a prospect so encouraging, should not be arrested except for conclusive reasons. We have given our reasons for believing that in the case of this enterprise the reasons urged for arresting it are not conclusive. In order to show sufficient cause for interference on the part of the State under such circumstances, it is, in our opinion, not enough to prove that circumstances can be conceived under which the existence of a Channel Tunnel might involve a more or less remote risk to the country, or that it is impracticable to devise precautions upon which absolute reliance might be placed "in every imaginable contingency." This is, however, all that has been done in the present instance by the opponents of the tunnel project. They have, with much ingenuity, assumed the presence of every condition favourable to the view which they entertain, and the absence of every condition unfavourable to it, but they have not been able to show that there is the slightest prospect

of the simultaneous presence of the whole of those favourable conditions, and unless this be assumed the whole argument founded upon them falls to the ground.

136. Holding these opinions, we have no course open to us except to recommend that this enterprise should not be prohibited on merely political grounds, and that it may be allowed to proceed, subject to the ordinary Parliamentary examination by committees.

137. The conditions under which that sanction ought to be given can scarcely be defined with precision until the details of the project are before the public.

138. The settlement of the defences is one which, as we have pointed out, cannot be effected until a particular scheme has been approved, and the situation of the English end of the tunnel finally determined. The extent and character of those defences, the alterations of the works now in existence at Dover, the addition of new works, should any prove necessary, the equipment of those works, the strength of the garrison to be maintained in them, the character of the appliances for closing the tunnel or for destroying it, the precautions necessary in consequence of the increased importance of the fortress, all these must be determined by the Government in concert with its military advisers.

139. We desire, however, to express our opinion that the exit of the tunnel and its approaches should be placed under the exclusive control of the military authorities.

140. It was, we observe, laid down as indispensable in the letter of the Secretary of State for War to the President of the Military Committee, dated 23rd February, 1882, that the first charge and maintenance of

all necessary works would have to be defrayed by the owners of the tunnel. It seems to us that of the extra expense which may be occasioned to the nation by the necessary addition to the strength of the works at Dover, the proprietors of the tunnel may fairly be required to bear a part; but without further evidence as to the total expenditure required, we cannot take upon ourselves to make a specific recommendation on this head.

141. We received during the course of our inquiry from gentlemen representing both the schemes at present in existence assurances of their readiness to contribute, within reasonable limits, to the erection of any new works which may be needed.

142. We apprehend that, in accordance with the usual practice, the rates which the proprietors will be allowed to charge will be regulated beforehand; we consider that these should be fixed upon a scale calculated to induce the proprietors to look for a profit to a largely extended business upon terms attractive to the public rather than to a more restricted one with higher charges.

143. Special arrangements by convention will be necessary in order to secure facilities for through communication and reasonable through rates over other lines in connection with the tunnel on this and on the other side of the Channel.

THE CHANNEL TUNNEL AND NATIONAL DEFENCE—II.

The cogent reasoning and closely packed arguments in Lord Lansdowne's Draft Report would appear finally to disprove the charge that the construction of the Channel Tunnel would involve an additional risk to our national security, but his Lordship's Draft Report was written forty-five years ago, and we have yet to inquire how far the conditions then existing have been affected by the inventions and political and other changes which have since taken place.

When Lord Wolseley spoke of the possibility of an attempt being made to seize the English end of the Channel Tunnel during a period of profound peace, there is no doubt that he had in his mind the events which preceded the Franco-Prussian War, only twelve or thirteen years earlier.

The whole period of the Second Empire had been marked by a restless military spirit, with continual armed intervention in the affairs of various European states, and indeed, in 1858, invasion had been seriously apprehended by England on account of the menacing tone of the French press. This attitude produced the Volunteer movement in England, and coastal defences were set up on our shores.

The waning popularity of the Emperor of the French led him in 1870 to declare war on Prussia, thinking a

successful campaign would establish him more firmly on his throne, and would assure the future of his dynasty.

Before hostilities commenced, the question of the Spanish succession, which had been the ostensible cause of the dispute, had been settled in accordance with the wishes of France. There was, therefore, no longer any ground for war, and no national interests were involved. The war was waged, as many previous wars have been waged, in the personal interests of a dynasty, and it brought that dynasty to its doom.

The danger of war from France for dynastic purposes has passed ; the other great military dynasties of Europe have also passed, and thus one cause, at least, of cynical and unjustifiable wars exists no longer.

It may be said that the foreign policy of France since the Great War has not been characterised by special consideration for British interests ; but there is a wide difference between the pursuit of somewhat divergent political aims and a filibustering surprise night attack on the English end of the Channel Tunnel in a time of profound peace, with a view to bringing over a large army which should march on London, and hold the capital city of the Empire to ransom.

Do democratic countries in the twentieth century wage war on each other in this tribal fashion ? Can we imagine Sir Austen Chamberlain conspiring with Sir Laming Worthington-Evans to seize the French end of the Channel Tunnel and march on Paris ? The idea has only to be stated to show its manifest absurdity, and are the statesmen of France less honourable and prudent than our own ? It is time this foolish and unworthy chimera was finally laid to rest.

War is impossible between Great Britain and the United States; it is more than a century since Great Britain and France drew the sword against each other, and although during that period, there have been moments of acute tension, forbearance and statesmanship have rounded the difficult corners. With the removal of the German menace, however, a strong motive for Anglo-French co-operation disappears, and it is probable that for some time Anglo-French relations will be far less cordial than they were for the years immediately preceding the late war.

That a clash of interests would be allowed to drift into war is improbable. "The greatest of British interests is peace," an axiom which has become the watchword of the Foreign Office, and under no circumstances would French diplomacy sanction a policy calculated to promote an Anglo-German entente or defensive alliance, especially as Russian support for France is no longer available.

The best military opinion on the Continent considers that no attempt on the Channel Tunnel in any conditions whatever would have the slightest prospect of success, and if a surprise attack were made and failed, Anglo-French relations would be embittered, and all co-operation rendered impossible for a century.

For this reason, the chances of failure being so great, no country would risk the loss of prestige involved in an abortive raid, and no instance of such a raid between one civilized nation and another in time of peace has ever yet been recorded in the history of mankind.

Should, however, a difference prove incapable of

diplomatic settlement, it is not thought that the Tunnel, of which the exits will only consist of a couple of holes 23 feet in diameter, would afford any assistance to the enemy. During the critical negotiations, they would be invested in force, and when diplomacy failed, the Tunnel would be blown up, and the struggle would take place as if it had never existed.

No one would contend that Great Britain ceased to be an island if she were connected to the Continent with a bridge, and she remains just as much an island if connected to the Continent by a tunnel. Either can be destroyed in case of necessity with equal facility, thus instantly restoring the *status quo*.

There are Englishmen who are unduly depreciative of the British Army, but it is of fine quality and highly trained. It is therefore absurd to suggest that it is incapable of guarding securely a single strategic point of such limited area as the English end of the Channel Tunnel.

As the gauge of the proposed Railway will differ from that of the French railways, any raiding party coming through the Tunnel would have to be collected or transhipped at one of the railway stations or some other point on the proposed Railway; in view of the heavy traffic and frequent train service on the Railway, English motormen and guards, with English passengers, would be continually working over the whole line from London to Paris and back, and any unusual concentration of troops on the Railway would be at once reported in London.

If an invading force came through the tunnel by train during the night, stopping at the tunnel entrance at Monk's Horton, the fact of an unauthorised train or

train stoppage would be instantly known to the signalmen in charge, who would be in telephonic communication with their colleagues in the next box in the direction of London.

Even if the wires were cut before they could speak to the neighbouring signal box, the occupants of the latter would discover that communication was interrupted, and in the ordinary course of their duty would advise headquarters.

The military guard would also be instantly on the alert in the event of any unusual happening, and the bomb-proof observation post would naturally be in communication by underground telephone wires and wireless with other military depôts in the county and elsewhere. It is, therefore, impossible to believe that a raiding force passing through the tunnel could elude detection for more than a few minutes, and there are considerable forces of troops stationed at Dover, Canterbury, Shorncliffe, Maidstone, Chatham, and London, who would be immediately summoned by telephone and brought to the scene of action by motor-cars or by railway. In 1883, when evidence was given before the Select Committee on the Channel Tunnel, telephones had only just been introduced, wireless telegraphy was in the experimental stage, and motor-cars were not invented, and the powers of reporting and promptly crushing a raiding party have been enormously increased since that date.

If an attempt on the Channel Tunnel were made by sea, the nearest point is Hythe, which is about six miles distant. This is three times as far from the sea as the entrance originally proposed at Dover. A force of

1,000 men could not be landed in less than one hour, and they would require two more hours to march to the mouth of the tunnel. Is it conceivable that this could be done without attracting the attention of the police or the coastguard who nightly watch our shores? The larger the force, the longer the time required for disembarcation, and the greater the risk of discovery. We will, therefore, assume that the invading force is limited to 1,000 men, without artillery, which could not be landed in the time allowed. We will further assume that they commence landing at 1 o'clock in the morning; that they escape observation; that they arrive at the fort at 4 o'clock, and it is in their hands by 5 o'clock. Would not the first act of the commander, on hearing of the attack, have been to demand reinforcements by underground telephone and wireless, at the same time blowing up the land portion of the Tunnel, and, as the Tunnel mouth would be only 45 minutes distant from London by the proposed Railway, would not the invaders be secured in a few hours, even if they had captured the fort?

If warning is given by strained political relations, there is no difficulty in destroying the Tunnel; if a large raiding party is sent in a time of profound peace, discovery is certain; the alarm is given; the Tunnel is closed; troops are called up from far and near, and the Navy is summoned by wireless to intercept any boats with members of the returning force on board. A smaller party would have a better chance of effecting a surprise, but they would have no opportunity of establishing themselves before an overwhelming force would be brought against them.

One feature which has distinguished the Great War from any which have preceded it has been the use of aeroplanes.

A raid on the Channel Tunnel might be preceded by an aerial bombardment or an aerial gas attack. A bombing attack would announce itself, and as soon as the guard reported that an attack was in progress the commander of the garrison would destroy the tunnel in accordance with detailed instructions previously issued to him, and when the raiding party arrived they would no longer find it intact.

A strong military patrol would always be provided to guard the tunnel at night; the possibility of a surprise gas attack would not be overlooked by the military authorities, who would provide protective apparatus and full regulations and frequent drill for the use of it in an emergency. However suddenly the attack might be made, it is impossible to believe that all the guard would be instantly incapacitated and would be incapable of giving the alarm, which would result in the destruction of the Tunnel.

In addition, a considerable body of men would be working all night at the Monks Horton railway station and goods yard, situated in the immediate neighbourhood of the Tunnel, partly in connection with the examination and repair of the permanent way of the Channel Tunnel; with cleaning and overhauling passenger rolling stock, and also with the arrival and parking of goods trains to the Continent, which would resume their journey as soon as the Tunnel was reopened for traffic, after the nightly survey. The effects of the gas attack would not be confined to the Channel

Tunnel defence forts, they would spread to the adjoining railway station and paralyse operations there. The working of the whole line would be suspended from the block at Monks Horton. Through the railway telegraph and telephone service, information of the attack would be transmitted to London, if necessary, entirely independently of the military authorities, and when the attacking force arrived they could hardly fail to find that adequate arrangements had been made for their reception.

If England and France were at war, and both ends of the Channel Tunnel in the enemy's hands, the approaches to the Tunnel would be ceaselessly bombed by our aeroplanes. The aeroplane is less suited for defence than for attack, and it is thought that even if the enemy had a very large numerical superiority in the air, it would not suffice to save the approaches to the Channel Tunnel from such damage as would render it absolutely useless to him. However camouflaged, the railway lines would indicate the position with sufficient precision to our airmen, and long range guns would be trained on the Monk's Horton entrance to the Channel Tunnel, the position of which would be accurately known.

The French end of the Channel Tunnel would be only 3½ miles from the coast at Wissant, and the English end only 6 miles from Hythe. Both these points would be within easy range of gunfire from our warships, and are situated in rather deep cuttings, which would crumble under high explosive, thus effectively blocking the railway approaches to the Tunnel. The problem would be simplified by the limited area of the

objective, thus permitting all gunfire to be concentrated on a single spot in England and one in France. Half a mile south of the French entrance to the Tunnel, the proposed Railway will be carried on a lofty embankment for some distance, or a viaduct could be substituted, and the structure and trains travelling upon it in war time would offer an easy target to ships at sea.

It will therefore be seen that even if it is conceded that a raid might be successful, there are numerous ways by which the use of the Tunnel could be denied to an enemy, and for this reason it is excessively improbable that the attempt would ever be made, and even more unlikely that if made it would be crowned with success.

Efforts have been made to show that with the fall of autocratic dynasties the risk of war has been lessened, and that the modern inventions of telephones, wireless telegraphy, and motor-cars, all of which were either unknown or in their infancy in 1883, have entirely extinguished the remotest possibility of a successful surprise attack being made on the English end of the Channel Tunnel in a time of profound peace. In any other circumstances, the Tunnel entrance would be rigorously guarded, and the Tunnel itself destroyed if circumstances rendered it necessary. It is further thought that even if the entire Tunnel were in enemy hands, he could be denied the use of it by aeroplanes and gun-fire, and unless he changed the gauge of the Tunnel, he would have to tranship all his stores and munitions of war at points which would invite aeroplane attack. It is, therefore, respectfully submitted that the construction of the Channel Tunnel cannot in any respect

whatever endanger the national security, but that it will tend to strengthen it by providing increased facilities for intercourse and mutual understanding between ourselves and the French people.

The Channel Tunnel scheme was revived in 1906 by the Channel Tunnel Company, Ltd., and Sir Douglas Fox and Partners submitted a report to the chairman and directors of the company on the 1st January, 1907. This valuable and informative document is reprinted in the Appendix. No further parliamentary action was, however, taken at this time.

On the 26th June, 1924, the Prime Minister, Mr. Ramsay MacDonald, received a deputation of members of the House of Commons Channel Tunnel Committee, who wished to urge on the Government the desirability of sanctioning the construction of the Channel Tunnel.

Sir William Bull, chairman of the Channel Tunnel Committee, introduced the deputation, and explained that it was backed by at least 400 Members of Parliament, representative of each of the three political parties.

Mr. T. P. O'Connor, Mr. Bowerman, Mrs. Wintringham, Viscount Curzon, and Mr. Foot spoke in favour of the scheme.

The Prime Minister said that they must all admit that circumstances had changed very much in reference to questions of strategy within the last few years. The whole question would have to be very carefully considered from a practical and detailed point of view. He had, therefore, summoned a special meeting of the

Committee of Imperial Defence for next week to consider the matter and report to him about it. He wished to lift this question, as had been done so far very successfully, out of party politics ; he also wished to get the very best responsible advice from those who could speak with great authority on the subject. All the ex-Premiers had accepted the invitation to be present.

Until the Committee of Imperial Defence had given its report on the subject, it would be very improper for him to commit the Government definitely to any view. There would be no delay beyond what was necessary to make an exploration of the question. What he wished them to believe at the moment was that they were interested in the project, and were taking steps to get the whole matter re-explored, so that without delay the Government might make an announcement in the House of Commons as to what its attitude was to be on the subject.

The Prime Minister made his promised statement to the House of Commons on the 7th July, 1924. He said :

" The Government have had under consideration the question of the Channel Tunnel, which was brought to their notice by the members of the House of Commons Channel Tunnel Committee. In a memorandum with which the committee were good enough to furnish me, it is stated that virtually 400 Members of this House have now declared their intention to support the scheme. Some Members attached the condition, to which the House of Commons Channel Tunnel Committee assented, that the approval of the naval and

military authorities and of the Committee of Imperial Defence should first be given, and the committee gave me to understand that the promoters would, in the absence of such approval, be unwilling to launch the project.

" I accordingly decided to refer the matter to the Committee of Imperial Defence, and, partly in order to reinforce the Government by the opinion of those who had had the responsibility of deciding this question in the past, and partly with a view to removing it altogether from the sphere of party politics, I invited the four former Prime Ministers, who had been chairmen of the Committee of Imperial Defence (Lord Balfour, Mr. Asquith, Mr. Lloyd George, and Mr. Baldwin) to attend a meeting on the subject.

" The members of the Committee of Imperial Defence, including the former Prime Ministers, were given all possible information bearing on the subject. Apart from several communications from the House of Commons Channel Tunnel Committee, including some notes on French official opinion and the verbatim notes of their deputation to myself, the committee were furnished with an exhaustive summary of the earlier history of the question. In addition, they had before them a series of papers on the subject prepared in several of the Government departments in the year 1920. These included memoranda by the General Staffs of the three Services, as well as a very complete report prepared in 1920 by the Home Ports Defence Committee on the safeguards to be imposed from a defensive point of view if the Tunnel should be built, and the considered opinions of a number of Ministers.

Memoranda on the commercial and transport aspects of the scheme were furnished on the present occasion by the Board of Trade and the Ministry of Transport respectively. Finally, the Committee of Chiefs of Staffs met a few days before the main committee, and furnished a joint report on the military aspects of the problem. They supplemented this report by verbal statements at the meeting.

"Thus the committee had before them, not only the views of their predecessors, but a series of memoranda on the latest aspects of the project prepared in the light of war experience and post-war conditions. There was, therefore, no side of the question on which the fullest possible information was not available.

"I think that most of those present, like myself, had approached the subject with a certain predisposition in favour of the Channel Tunnel. When the evidence came to be discussed, however, it was found that every one had been forced to an opposite conclusion. The advice of the staffs of the Admiralty, War Office, and Air Ministry was against the project. While the scheme offered very slight attractions from a military point of view, it was found to involve considerable military disadvantages.

"From the point of view of security, the Committee of Imperial Defence do not wish to overstate the risk, but they are advised, as their predecessors were advised, that there is unquestionably an element of danger involved. While naval and military opinion in the past has differed considerably as to the extent of this danger, there appears no room for doubt that the existence of a tunnel would be bound to add something

to the anxieties of those responsible for national defence, to our commitments, and to our expenditure. And, as pointed out by Sir Henry Campbell-Bannerman in a statement on the subject in this House in 1907 :

" ' Even supposing the military dangers involved were to be amply guarded against, there would exist throughout the country a feeling of insecurity which might lead to a constant demand for increased expenditure, naval and military, and a continued risk of unrest and possibly alarm, which, however unfounded, would be most injurious in its effect, whether political or commercial.'

" The committee were also advised that, if ever the Tunnel was built, Government ownership would tend to facilitate the taking of measures whether for its security or destruction.

" Having examined the defence aspects of the question, the committee turned to its civil aspects in order to ascertain whether there were overriding advantages which would justify them in advising that the military risks involved should be run. The committee were informed that the construction of the Channel Tunnel would have but little effect on the foreign trade of this country. The question of passenger traffic is alone important, and by it the Channel Tunnel scheme as a commercial enterprise must stand or fall. If, however, the Tunnel, when completed, succeeded in attracting passenger traffic to the extent which its promoters hope for, one result would be the gradual disappearance of the cross-Channel steamship services.

" As regards relief to unemployment, the Parlia-

mentary Committee estimate that on the Tunnel itself about 2,500 men would find employment on the English side, and an equal number on the French side of the Channel. There would, in addition, be consequential employment elsewhere, and one of the estimates in the memorandum of the Channel Tunnel Committee was for an over-all figure of 12,000 workers in Great Britain and 12,000 in France.

" The Committee of Imperial Defence were unanimous that the advantages of the Channel Tunnel were not commensurate with the disadvantages from a defence point of view. Further, they took the view that all that has happened in the last five years in the way of naval, military, and air development has tended, without exception, to render the Channel Tunnel a more dangerous experiment.

" That was the unanimous opinion of the Committee of Imperial Defence, who accordingly recommended that at the present time the Channel Tunnel ought not to be proceeded with. In view of this, the Government had no alternative but to accept the advice of the Committee of Imperial Defence."

On the 27th August, 1928, the great international Peace Pact was signed in Paris. Originally the conception of a distinguished French statesman, Monsieur Briand, the idea was extended by Mr. Kellogg, and the multilateral treaty condemning recourse to war for the solution of international controversies and renouncing it as an instrument of national policy in their relations with one another has been signed on behalf of the United States of America and all the principal countries

of Europe, including France, Great Britain, Germany, Italy, and Spain.

Men of little stature may speak lightly of the treaty, saying that treaties have been broken in the past and may be broken again, but to those that have eyes to see, this treaty marks a great stage on the road to international peace.

It is impossible to imagine that a great nation, whose dead lie with our own on unnumbered fields, which has drunk the bitterness of war to the dregs, and which has solemnly signed the Pact of Peace in her own capital, should break that Pact by a traitorous night attack on the Channel Tunnel in a time of profoundest peace. Perish the thought; it is inconceivable, even were our frontier as unguarded as that between the United States and Canada, the children of England and France in the New World.

International trust is a plant of very slow growth, but progress is discernible if we compare the present position with that of a century ago. The period intervening has coincided with the introduction and development of the iron road all over Europe and elsewhere, which by providing improved opportunities for international intercourse, has been a potent factor in the creation of good-will between nations.

That the continuation and extension of this beneficent work by the construction of the Channel Tunnel should be obstructed without reason or explanation is little short of a tragedy, and there are many in this country who feel that this attitude casts an undeserved reflection on our great Partner in the late War. Surely

we may hope that this timorous and short-sighted policy will now be reversed.

In the speech above quoted, Mr. Ramsey MacDonald stated that the Committee of Imperial Defence were unanimous that the advantages of the Channel Tunnel were not commensurate with the disadvantages from a defence point of view. The present scheme, however, contains several novel features; the European political outlook, thanks in no small measure to the untiring efforts of Sir Austen Chamberlain, has become more settled, and it is thought that when the traffic facilities offered by the scheme have been duly weighed and considered, the balance of advantages might now be found to lie on the side of the Channel Tunnel.

APPENDICES

APPENDIX I

CONSULTING ENGINEER'S REPORT

THEODORE STEVENS.
M.INST.C.E., M.I.MIN.E.,
M.I.E.E.

Telephone: HOLBORN 5250
BUCKHURST 0193.

50, Lincoln's Inn Fields,
(PORTSMOUTH STREET)
London, W.C. 2.

30th July, 1927.

Wm. Collard, Esq.,
20, Savile Row, London, W.1.

DEAR SIR,

Complying with your request of 24th June for me to examine your estimates for the broad-gauge railway you propose between London and Paris, I submit herewith the results I have been able to arrive at.

On 28th June you showed me your Maps with complete location of the route, sections and tabulated calculations of the quantities of your careful survey and estimates.

My conclusions are that your quantities were most carefully determined, and that your estimates are sufficient for the works I have examined, provided that these works are energetically and loyally managed in the best interest of your project.

Taking your headings in the order they occupy in your Summary of Estimates, I separate those upon which I have spent some time as follows :—

Examined to some extent.	Not examined.
	Land and compensations.
Viaducts.	
Tunnels.	
Cuttings.	
Stations.	

Examined to some extent.	Not examined.
Permanent way.	
Substations.	
H.T. Transmission.	
	Sundries.
	Electric Track work.
	Junction.
Rolling Stock.	
	Hotel.
	Dwellings for dispossessed.
	Workshops and cottages.
	Omnibuses and vans.
Survey.	Legal and Parliamentary.
	Interest during construction.

I appreciate your broad view of the problems involved and your independence of prejudices of those who for many years barred progress in connection with the Channel Tunnel in its former restricted form. (Under your scheme it is less than one-tenth of the route length.)

Were they victims of that " most insidious of all diseases which," as Lord Balfour has said, " comes upon those who, without losing their health or their intellect, nevertheless get somewhat petrified in the old courses which they have pursued, whose authority grew because they had been long in the public service, but who could not deal with the freshness and elasticity really desirable in connection with great problems perpetually arising in this changing world " ?

I offered to deliver this to you in so short a time that I have not opportunity, which I would like to rearrange the Appendix hereto containing details and costs on some other works, more or less similar to what you propose. Specific references are given to the sources of the information.

Please advise me whether you want me to go further than I have gone. It would give me pleasure to have a hand in so admirable a project.

Yours faithfully,

(*Signed*) THEODORE STEVENS.

APPENDIX II

CHANNEL TUNNEL: REPORT BY SIR DOUGLAS FOX AND PARTNERS

The following Report on the project was presented to the Chairman and Directors of the Channel Tunnel Company on 1*st* January, 1907 :—

28, Victoria Street, Westminster, London, S.W.

GENTLEMEN,

1. In accordance with your instructions, we have given careful consideration to all the circumstances connected with the International work, for the construction and operation of which your Company was formed, and we have, as requested, considered and settled with your Engineer, Mr. Francis Brady, the detailed plans, sections and estimates for the application to Parliament which is now being made in order to obtain the necessary authority to proceed with the works.

2. We have also placed ourselves in communication with M. Sartiaux, the General Manager of the Chemin de Fer du Nord, and have had personal interviews with his representative, M. Paul Emile Javary, and we have visited Dover, Sangatte, and Paris, and inspected the models, showing the respective plans of the British and French Companies.

3. The numerous proposals which have, during many years, been put forward for bridges over the Channel, for train ferries on the Channel, and for tunnels under the Channel between Dover and Calais, show the importance which attaches in public opinion to the question of improving the means of communication between Great Britain and the Continent of Europe. A full description of these, and of the communications which took place between the British and French Governments, will be found in a report by M. Sartiaux.

4. Of the first, the most noteworthy are: Thomé de Gamond's suggestion of 1857, to bridge the Straits between East Ness Corner and Calais; A. Motiers' proposed bridge between the South Foreland and Cap Grisnez in 1875; a bridge designed by Messrs. Schneider et Cie., H. Hersent and Sir Benjamin Baker, to pass over the Varne and Colbart Banks, estimated cost £34,000,000; and a similar scheme by Renard in 1890 for a shorter bridge between Cap Blancnez and South Foreland, estimated cost £28,320,000. It is here interesting to note that M. Renard in a survey of the Channel bed found that it was composed of regular, homogeneous beds of chalk. Speaking generally, bridge schemes have failed through their great initial cost, the expense of maintenance, opposition from navigators, difficulties of deep foundations, and liability of the works to be destroyed by storms.

5. Of the second, Thomé de Gamond's proposal in 1837 for a ferry. Between 1862 and 1870, Sir John Fowler brought forward several schemes for train ferries on lines suggested by Mr. Evan Leigh, and clients of ours, in conjunction with a French company, applied for similar powers in 1905. These schemes failed through opposition from the Admiralty and from harbour authorities. An Act was passed in the last session of Parliament giving general powers to the last-named combination, for such a ferry, but without defining its exact position. These projects, though economical from a capital point of view, would not relieve traffic from the uncertainties of the sea and weather, and from the dangers of navigation, and would still involve delays.

6. Of the third or tunnel projects the following amongst many others may be mentioned: In 1802, a French mining engineer, M. Mathieu presented to Bonaparte a scheme for a submarine tunnel, which was personally supported by the British statesman, Charles James Fox; Thomé de Gamond's proposal in 1859, for a tunnel through the chalk, from Eastware Bay to Cape Grisnez, approved by Brunel, Locke, and Robert Stephenson. The same project was revived in 1867, and the Channel Tunnel Company, formed under the auspices of Lord Richard Grosvenor, Sir Edward Watkin, and the South-Eastern Railway Company brought forward a similar one in 1883. The Bill deposited by this Company was rejected, largely on military grounds, by a Select Committee in July, 1883.

Tunnels have also been suggested by J. F. Smith in 1861, and by Zerah Colburn, Thomas Payne, P. T. Bishop, and others.

7. Great improvements have, of late years, been introduced into the Cross-Channel service, but serious delay and much discomfort and inconvenience still arise from the necessity for double transhipment, and from the passage itself. We have met with a very general opinion that through and uninterrupted communication would be of great advantage and convenience, not only for passengers and light and perishable goods, but also for heavy traffic. The existence of through communication between Dover and Calais would undoubtedly tend to increase the transatlantic trade from British ports.

8. The preliminary operations of the two companies at Dover and Sangatte have been of importance, to a great extent as a practical test of what may be anticipated in carrying out the proposed works.

(*a*) DOVER.—A gallery 7 feet in diameter and of true circular form was driven in 1882–1883 from the west side of Shakespeare's Cliff by Colonel Beaumont's boring machine. It was completed on a descending gradient of 1 in 80 for a total distance of 2,300 yards, when the works were stopped, the present face being under the sea near the former end of the Admiralty Pier. The gallery is throughout in the grey chalk, and it proved to be almost dry. The volume of water entering the entire length of the heading is said to have only amounted to 1½ gallons per minute, which gradually diminished. Considering that no iron or brick lining was employed, this amount of water is a negligible quantity.

The engine-wright, who had charge at that date of the machinery, informed us that a piston pump 4 inches in diameter was only required to work half a day in a fortnight, in order to keep the gallery dry.

(*b*) SANGATTE.—According to the Report of the Committee presented to the French General Assembly, 9th May, 1883, a total length of 1,839 metres (2,009 yards) of similar gallery was driven up to the date when the works were stopped on 18th March, 1883. This gallery was chiefly carried out by means of Colonel Beaumont's boring machine, and, in consequence of the men becoming accustomed to the work, as much as 115 yards were executed in six days.

The present " face " of this gallery is under the Channel, 800 metres from the beach, measured at right angles to the coast.

The depth of the sea at this point is 27 feet below low water, and the thickness of " cover " is about 100 feet.

We understand that the quantity of water entering the gallery was about 400 gallons per minute.

This experimental gallery was unlined.

We are informed that, although the water in the shaft rises and falls with the tide, the volume is very small and the infiltration is slow, as indicated by the fact that, with a rise and fall of tide of 18 feet the water in the shaft rises and falls only to the extent of a few inches.

9. We have studied the opinions of the eminent geologists who have dealt with the strata met with on both sides of the Channel.

10. The strata which form the coast of England between Dover and Folkestone, and of France between Sangatte and Wissant, and which lie beneath the English Channel between those points, dip in a northerly direction.

In 1876 and 1877 the French geologists, Messrs. Potier and Lapparent, took some 7,600 samples of the bottom of the Channel, 3,267 of which they were able to utilise. It was found from these that the lines of outcrop of the strata are very nearly parallel to a line drawn from Folkestone to Sangatte.

By noting the composition of these samples, and the position from which they were taken, it is possible to follow the outcrop of the strata which appear in Shakespeare's Cliff, and in the shafts sunk close to it, the whole way across the Channel to the coast between Sangatte and Escalles.

The geological system to which these strata belong is the Cretaceous, which is divided into two divisions, upper and lower. It is only necessary to deal with the upper (*Fr. Série Supra-Crétacée*). This is divided into four sub-divisions, the lowest being the (*a*) Gault and Upper Greensand (*Fr. Albian*), followed by the (*b*) Lower Chalk (*Fr. Cenomanian*), (*c*) the Middle Chalk (*Fr. Turonian*), and (*d*) the Upper Chalk (Fr. *Senonian*).

These successive strata are very clearly seen in the cliffs on the French coast between Escalles and Sangatte. They incline gently from the top of the cliffs to the beach in a north-easterly direction.

11. The following are the chief characteristics of these beds (the thicknesses given having been measured at the Channel Tunnel experimental shaft at Sangatte, and at the shafts sunk near Shakespeare's Cliff, Dover) :—

(*a*) The Gault and Upper Greensand are equivalents of one another, formed contemporaneously, under different conditions of sedimentation. The Gault is a dark, stiff, blue and sometimes sandy clay; the Upper Greensand, an inconsistent group of greenish sands and sandstones.

(*b*) Above the Gault and Upper Greensand comes the Lower Chalk, at the base of which is a well-defined band of Glauconitic or Chloritic Marl (Fr. *Craie Glauconieuse*) 11 feet thick near Dover, 10 feet 6 inches thick at Sangatte; a greenish chalk containing grains of Glauconite and Phosphatic Nodules.

Above this lies a layer of Chalk Marl (Fr. *Craie Marneuse*), 23 feet thick at Dover, 29 feet at Sangatte, a clayey chalk, impervious to water.

Above this comes the great body of the Lower or Grey Chalk called by the French, *Craie Grise* and *Craie de Rouen*, at Dover 87 feet thick, at Sangatte 80 feet. It is a compact impervious stratum of greyish-coloured chalk, containing no flints, and, so far as can be ascertained, free from fissures and slides. It is in this bed of chalk that it is proposed to construct the Tunnel, as being a most excellent material in which to work, and one which possesses the peculiar property of gradually "puddling" itself and becoming impervious.

(*c*) Above comes the Middle Chalk, white in colour, containing a few flints, and at its base a band of hard nodular chalk (Melbourn Rock).

The division between the Middle and Lower Chalk is well marked on the cliffs, west of Sangatte, by small springs of water and lines of vegetation growing on the face of the rock. The water which has found its way through the Upper and Middle Chalk is unable to pass through the impervious Lower or Grey Chalk and trickles out, on the face of the cliff, at the junction of the two strata.

(*d*) The Upper Chalk is a mass of white pulverant chalk containing scattered flints. It forms the upper portion of the Shakespeare's Cliff near Dover. The Upper and Middle Chalk

contain a considerable amount of water, which percolates through the lines of flints.

12. As a result of our interviews and frequent communications we find ourselves in complete accord with the French engineers upon the following essential questions :—

(*a*) That the proposed Tunnels can be constructed throughout in the Lower or Grey Chalk, a stratum very homogeneous, practically free from, and remarkably impervious to, water.

(*b*) That the occurrence in the Grey Chalk under the Channel of water-bearing fissures is improbable, but not impossible.

(*c*) That the presence of any such fissure can be foretold with certainty, and without risk to the men employed, by providing a pilot drill to be attached to the boring machine, an advanced trial hole being thus always kept in front of the excavation.

(*d*) That, should such a fissure be encountered, due precautions can be taken according to well-tried engineering methods, which, in the opinion of the French engineers and ourselves, would ensure the work being carried past the fault, any water arising from such fault being duly excluded.

(In the Mersey Tunnel and elsewhere we have encountered fissures which we have thus dealt with successfully.)

(*e*) That a Drainage Heading should be driven from each side of the Channel rising towards the centre and connected at Dover and Sangatte with shafts for pumping and winding.

(*f*) That the Main Tunnels should consist of two "single track" circular tunnels, each of 18 feet nett internal diameter, and thus large enough to accommodate the rolling stock of the British and French main lines, except only their locomotives, for which would be substituted electrical locomotives of ample power to deal with the heaviest trains running upon the main lines.

(*g*) That there are several great advantages to be derived from this plan, as compared with the construction of a double "two-track" tunnel, viz. the vertical dimensions are much reduced, thereby rendering it easier to adjust the position of the tunnels in the Grey Chalk; the ventilation of the works, both during construction and after completion is rendered simpler, and more efficient; the cost of any lining is much reduced; and the work can be more readily carried out by the well-tested system of shield, combined with mechanical excavators.

(*h*) That the Tunnels should at frequent intervals be connected by cross passages with air-tight doors, thus rendering it easy to introduce currents of air, and to exchange workmen from one Tunnel to the other.

(*i*) That the Tunnels should be well lighted and thoroughly ventilated, and the traffic worked by electricity.

13. Dealing now with the Specification for the Works which would devolve upon the British Company to execute, we propose to provide for two "single-track" Tunnels as above-mentioned, 12 miles in length from high-water mark to the middle of the Channel, each of 18 feet nett internal diameter, one for the "Up," the other for the "Down" traffic, to be driven chiefly on a descending gradient, but with a slight rise near the centre of the Channel. These tunnels would be placed some 36 feet apart, measured from centre to centre, but connected together at frequent intervals by cross galleries, in this respect being very similar to the Simplon Tunnel.

14. The Tunnels to be driven by shields (the débris being carried by electrically driven belts to the waggons, which will be removed in trains hauled by electric locomotives), and to be lined throughout with cast-iron segments of ample strength to resist any possible pressure, and grouted on the outside, in the usual manner, by means of the "Greathead" grouting machine. By this method the outside of the Tunnel is completely surrounded by a covering of cement, which not only prevents leakage into the Tunnel, but also preserves the plates from corrosion on the outside.

After the plates are in position, the inner face would be lined with concrete in cement, and lime-washed, thus providing a smooth interior surface, so that in case of derailment of a train but little damage would accrue, owing to there being no projection or obstruction which could foul the vehicles. This lining would preserve the plates from corrosion on the inside and would also materially assist the ventilation.

15. The length of Tunnel under the land would be of ordinary construction for a double line, and be lined with brickwork.

16. In certain places, where the necessities of the work of construction, or of the traffic, demand it, an enlarged cross-section of tunnel would be provided, where the hauling machinery for removing the débris could be placed, and where pumps and

ejectors for freeing the Tunnel from water could be fixed. These would also serve as block stations for the signalling equipment, when traffic is running.

17. At frequent intervals along the entire distance, cross passages would be constructed, fitted with air-tight doors of suitable design. These galleries should be placed obliquely in order to facilitate the passage of trains of material both from and to the advanced faces and for the primary ventilation.

Thus the construction trains, as also the main air current, could enter by one of the main tunnels, and crossing over by the most advanced oblique passage, return by the other tunnel.

The secondary ventilation would commence at the last oblique passage.

Upon the completion of the work these galleries would, as before mentioned, serve as means of communication between the tunnels for the workmen on the Railway.

18. Having thus described the general arrangement and design of the permanent Tunnels, it is necessary to consider the important question of the Drainage Heading, which would be the first work to be proceeded with.

19. In order that the Drainage Heading may be proceeded with independently of the works of the Main Tunnels, and to facilitate the conveyance of spoil and the clearance of any water that may be met with, it is proposed to adopt the system we employed in the case of the Mersey Tunnel—and which is also to be adopted by the French engineers—of introducing a falling gradient of, say, 1 in 500 from the lowest point of the Tunnel on the British side to the pumping shaft near Dover. This Heading would be driven by a shield and connected with the Tunnels at such points as may be found desirable, thus rendering it of great service, not only for drainage purposes and for the removal of the excavated material, but also as supplementary to the main system of ventilation.

This Heading will probably have to be lined with cast iron, the plates having their edges planed and securely bolted together. These plates would be of sufficient strength to resist the full pressure, and, when grouted up, would be watertight. The only possible water-yielding area would thus be the actual face exposed, and one length of chalk to be covered by the next ring of cast iron.

The Drainage Heading would be excavated by means of the Beaumont or other approved cutter or of Price's electrical digger, now largely used in the tube railways of London. These machines work on a central shaft, an important feature as will be seen later.

20. An advance of 5 feet per hour can be secured both in excavation and also in the fixing of the iron lining ; but allowing for inevitable delays and for the long distances from the shaft, we are of opinion that, with properly designed machinery and arrangements, a speed of 2¼ feet per hour can be relied upon for six days in the week, it being desirable and necessary not to drive on the seventh, the men requiring rest and the machinery slight repairs.

Assuming 17 yards per day can be maintained for six days per week, this would represent an annual progress of about 3 miles at each face, occupying a period of four years to drive the Drainage Heading from the English to the French shaft (24 miles).

Three shifts of men would have to be employed, and the changing should take place below and on the spot, no stoppage of work being allowed. This was the system in the case of the Simplon Tunnel, where the drills never stopped even whilst the shifts were changing.

21. An emergency door would always be kept in position near the face of the Heading, not so much for actual use, but rather to induce confidence in the minds of the men at the front.

22. The diameter of the Drainage Heading is a matter of importance. Up to the present time the preliminary work has been carried out with a diameter of 7 feet. But, as this heading will have to serve for the line of communication for all labour and material required for the execution of the Tunnels it is essential that it should be of sufficient size to allow of two sets of waggons passing one another, and, at the same time, to leave sufficient space for air, water and power pipes, cables, etc. In our opinion it should not be less than 11 feet nett internal diameter.

There will be several break-ups into the Main Tunnels, and each will yield a large amount of excavation, and will also require a considerable tonnage of cast-iron plates to be delivered with strict regularity, and consequently a complete line of way in each direction is, in our opinion, important.

23. As soon as it is decided to proceed with the work we would recommend the following course to be adopted :

The Drainage Heading would be commenced and driven ahead, at as high a speed as was found to be practicable, it being a matter for the Directors to decide whether this should be completed before proceeding with the Main Tunnels, or whether they should be carried forward at the same time.

The break-ups or commencement of enlarged sections of the Main Tunnels already referred to would be made where the chalk had been found most suitable, and at each break-up a full-sized shield would be erected in order to permit of the excavation to the full external diameter of, say, 20 feet.

These large shields would be fitted with hydraulic or electric erectors, which we have previously employed, and which act like a human arm, take hold of the plates, lift them up and hold them in position until bolted in place.

This system of construction has been adopted in the latest instance of subaqueous work, namely, the Rotherhithe Tunnel now being built for the London County Council, and has proved highly successful, a pilot heading 11 feet 6 inches in diameter having been driven in advance, the larger tunnel 30 feet 8 inches in diameter following.

24. Each ring, as it is put in position, would be bolted up and grouted, so that, as already described, the only portion of the chalk laid bare at one time would be the actual working face, and a length of boring equal to one ring of plates.

25. Should broken ground or a fissure be encountered, arrangements would be made for fixing a miner's wedging crib in the nearest sound bed of chalk. This crib would consist of a ring of cast iron in sections, tightly wedged up with dry pitch-pine wedges and grouted, so as to prevent water travelling behind the plating.

So soon as the broken ground is passed and good solid chalk again reached, a second wedging crib would be fixed, and thus any water coming through the disturbed strata would be imprisoned between the two cribs, and prevented from travelling along outside the tunnel.

26. It will be necessary to keep an efficient supply of air throughout the entire length of the heading for the men employed. This can best be effected by bratticing off the upper portion of the heading, thus forming a conduit of the required size for the volume of air, which would be blown in by high-speed fans.

When the break-ups are begun, this conduit will also have to provide air for the men working at these enlarged faces, until the second tunnel and crossways are in progress. The ventilation can then be effected in a manner similar to that adopted at the Simplon. In that case there are two parallel galleries with connecting traverses. Fans blow the air in at the end of one tunnel, and, after travelling up to the most recently excavated traverse, it returns by the other tunnel.

This is known as the primary ventilation, and the volume of air is sufficient to keep all the galleries and traverses in a perfectly fresh condition.

27. To ventilate the advanced end at the face, secondary ventilation would be adopted, so as to effectually prevent the stagnation of air so common in advanced galleries of tunnels and mines, and enable the men to work with vigour and in comfort.

28. The question of the permanent ventilation has received our very careful consideration, and it may be desirable to state briefly how it would be dealt with when the Railway is open for traffic.

In the case of long tunnels, worked by steam locomotives, the most efficient system has been found to be: blowing the air against the traffic, by which means the driver and fireman upon whom the safety of the train depends, are kept in fresh air and free from smoke and steam. But in the case of electrically worked tunnels, where no products of coal combustion exist, the reverse is the better plan. The air will thus be blown in the same direction as that in which the train will be travelling, so that they will assist and not retard the current.

The traffic being electrifically operated, the volume of air required is very largely reduced.

We have assumed, as a maximum, a passenger train, each way every ten minutes, carrying 500 people. The volume of air per minute required to keep the tunnels pure and fresh will be about 45,000 cubic feet on each line of way, travelling at a velocity of 6 feet per second, which is equivalent to a very light breeze. There will be no difficulty in dealing with this—it being far less in proportion than we have had to provide elsewhere.

The power required to induce this current of air, assisted as it will be by the trains themselves, will not be large, and the entire problem is simple as compared with that in many large

collieries in which not only are far greater volumes of air blown through, but the length of passages through which the air has to be driven or exhausted is considerably greater and impeded by bends, which will not exist in this case.

29. The prevention of fire in the trains is also one to which much attention has been devoted. Fires which have occurred on electric railways, both in England and in other countries, have been due either to the motors or to improper "wiring" on the carriages. But in the case under consideration there will be no wiring necessary on the existing rolling stock. In the case of specially built rolling stock for the London and Paris and other expresses, no inflammable material should be used, and as the motors of the electric locomotive will be "armoured" against fire in case of short circuiting, no danger would arise as regards the electrical working even from the employment of ordinary rolling stock.

Assuming, however, that in spite of precautions any stoppage should occur in the tunnels, the passengers would readily pass along the tunnels in the rear of the train, where ample space will be available, as a footpath, clear of the electrical conductors. The passengers would thus be free from smoke, in consequence of the direction of the current of air always blowing from the rear of the train towards the front.

In consequence of the large diameter of the tunnels the electric conductors can be so placed as not to obstruct the permanent way or interfere with repairs.

30. The tunnels would be lighted throughout by electricity, and a separate and special circuit will be provided so that in the event of the main traction current failing, the lights in the tunnels will not be extinguished. The carriage lighting would be independent, each vehicle carrying its own store of light.

31. Similar sanitary and hygienic regulations to those so successfully adopted at the Simplon Tunnel will be enforced during the progress of the works.

32. The French engineers have satisfied themselves as to the best position for the sorting sidings and station at Sangatte, and as to the site for the deposit of their moiety of the excavation from the shafts, heading, and tunnels. We concur in their views.

33. The plans and sections, as now prepared and submitted to Parliament for the proposed Approach Railways on the British

side, provide sorting sidings and a station near Maxton, just within the Borough of Dover.

These railways are well laid out to accommodate the traffic, and, in conjunction with the station, where the exchange of steam for electric locomotives and all necessary sorting of traffic will take place, will provide full and complete means of communication with both the existing main lines between Dover, London, and the rest of England.

The station will be easily approached from Dover by an electric tramway, which passes very near the site.

In the immediate vicinity there is a deep valley, affording a site for the deposit of spoil.

34. Good sites are also available for the generating stations, and one of the first operations would be to instal a portion of the plant for construction purposes.

35. Summing up the engineering questions relating to the proposed Tunnel, we agree with M. Sartiaux and Mr. Brady in the opinion that the enterprise is one that can be carried out with certainty, and at comparatively moderate cost, the geological and other conditions being of an exceptionally favourable character for the construction of a submarine tunnel.

36. We have not felt it to be within our province to express any opinion upon the question of the best precautions to be taken to secure the Tunnel against its being made use of for aggressive purposes in case of war.

Foreign Governments, and notably the French, Swiss, and Italian military authorities, have introduced protective works in connection with the great Alpine tunnels, which could be readily reproduced in this case, the levels of the proposed Tunnel lending themselves to arrangements which would give each nation complete and independent control of the portion lying on its side of the centre of the Channel.

37. On the French side, it has been proposed to approach the Tunnel over a viaduct, which would be exposed to fire from the sea, and could thus be destroyed if required.

38. The mouth of the Tunnel on the English side, and the station near Maxton, lie fully exposed, as was recommended by the Parliamentary Committee, to both direct and plunging fire from the existing Citadel and Heights of Dover, whilst heights to the north of the site could be readily fortified.

39. We estimate the cost of the British half of the undertaking, including the purchase of land and buildings and the existing works at Dover, the electrical installation, the Drainage Heading and its shafts, winding and pumping machinery, the land approaches, the sorting station and the sidings, signals, and the junctions with the South Eastern and Chatham main lines, with administration, parliamentary expenses, legal and engineering charges, interest during construction and financial expenses, with the necessary provision for contingencies, at £8,000,000 (eight millions sterling).

We are,
Gentlemen,
Yours faithfully,
(*Signed*) DOUGLAS FOX AND PARTNERS.

APPENDIX III

ESTIMATE FOR ROLLING STOCK

Standard train for Continental traffic.

	£
3 1st and 2 3rd-class coaches to average £7,000 each ...	35,000
1 Dining car	8,000
1 Luggage van, or 2 halves, one at each end of train ...	5,000
1 3rd-class coach to occasionally replace dining car ...	7,000
1 Locomotive	25,000
Total	80,000

Accommodation, 300 1st-class and 264 3rd-class passengers, total 564 ; or when the additional 3rd-class coach is run in place of the dining car, 696 passengers.

Standard train for Outer Suburban traffic.

1 1st and 2 3rd-class coaches = 3, to average £7,000 ...	21,000
1 Luggage van, half at each end of train	5,000
1 Locomotive	15,000
Total	41,000

Accommodation, 100 1st-class and 264 3rd-class passengers, total 364, with corridor stock ; or non-corridor, 120 1st-class and 352 3rd-class ; total 472 passengers.

Standard Electric Motor train for Suburban traffic.

6 vehicles, in two sets, each composed of two motor vehicles and one trailer.

4 motor coaches at £9,000	36,000
2 trailer coaches at £6,000	12,000
Total	48,000

Accommodation, 96 1st-class and 352 3rd-class passengers, total 448 passengers per set, or 896 passengers per 6-car train.

	£
Single-car rail motors.	
Cost	9,000
Accommodation, 24 1st-class passengers and 128 3rd-class passengers, 152 in all.	
Covered waggons for Continental freight trains. These will be 40 feet over buffers, 12 feet 6 inches overall width, and carried on two bogies each; they will be fitted with Westinghouse or vacuum brakes, and close coupled with automatic couplings. The tare weight would be about 25 tons, and the maximum safe load about 40 tons. In the following calculations an average load of 25 tons per vehicle will be assumed.	
Cost per waggon	1,000
Covered and open waggons for merchandise and mineral traffic, locally in England and France. Dimensions as above.	
Average cost per waggon	850
Locomotives for Continental freight trains, also goods and mineral traffic locally in England and France.	
Cost per locomotive	20,000
Diesel electric locomotives.	
1st class, 1,000 h.p.	18,000
2nd class, 100 h.p.	4,000

ENGLISH SECTION. PASSENGER TRAINS.

Trains Nos. 1 to 6 London–Paris service.	
„ 7 to 9 London–Boulogne service.	
9 trains.	
5 add 50 per cent. for spares	
14 trains at £80,000	1,120,000
Trains Nos. 18 to 37=20 less 4 (see below)=	
16 London, Maidstone and Ashford.	
8 add 50 per cent. for spares.	
24 trains London, Maidstone and Ashford service at £41,000	984,000
4 trains in above service for use in rush hours to be as Continental services.	
4 trains.	
2 add 50 per cent. for spares.	
6 trains London, Maidstone and Ashford service at £80,000	480,000

	£
Electric motor 6-car trains for London suburban district Nos. 91 to 108.	
18 trains.	
9 add 50 per cent. for spares.	
27 Electric motor trains at £48,000	1,296,000
Single car rail motors.	
4	
2 add 50 per cent. for spares.	
6 Electric rail motors at £9,000	54,000

FREIGHT TRAINS, LONDON AND THE CONTINENT.

1. *Waggons.*

Estimated annual earnings	£9,749,999	
or	2,339,999,760	pence.
at $2\frac{1}{4}d.$ per ton-mile equals ...	1,039,999,894	ton-miles.
Divided by 300 equals	3,466,666	ton-miles per day
Assuming that half of these ton-miles travel between London and Paris, and half between London and Boulogne, and *vice-versâ*, we have between London and Paris ...	1,733,333	ton-miles.
Divided by mileage, 253, we have	6,852	tons carried daily between London and Paris in 6 hours 20 minutes (40 m.p.h.).
Assuming average load of 25 tons per waggon, and one journey per day, number of waggons required ...	275	
Or, two journeys per day	138	
London and Boulogne	1,733,333	ton-miles.
Divided by mileage 112, we have ...	15,476	tons carried daily between London and Boulogne, in 2 hours 48 minutes (40 m.p.h.).
Assuming average load of 25 tons per waggon, and one journey per day number of waggons required ...	620	
Each waggon in this service should make two double trips per day, reducing number required to ...	155	

Total waggons required for goods traffic between London and Continent and *vice-versâ*, with approximately 12 hours actual running per day, 138 and 155 = ...	293	
Say 300 and add 100 per cent. for spares	600	
Cost of 600 waggons at £1,000 ...	£600,000	
Cost of 300 waggons charged to English section		£300,000

2. *Locomotives.*

14 loaded waggons each weighing 50 tons gross, tare 25 tons, net load 25 tons, give a gross train load behind the locomotive of	700 tons.	
With the exception of the exits from the Channel Tunnel, at 1 in 165 and 1 in 185 respectively, the gradients on the route will be very favourable, and will not exceed 1 in 705.		
300 waggons in 14-waggon trains require	22 locomotives.	
The average speed of the express goods trains will not be materially in excess of that of the stopping passenger trains on the slow lines, and it should not be difficult to work an appreciable number of them during the daytime. Additional locomotive power could be provided on the Channel Tunnel section, which will have only one track in each direction, to avoid unduly prolonged occupation of tunnel by goods trains to detriment of express passenger traffic. Extra for double heading...	6 locomotives.	
28 Continental freight train locomotives.		
14 add 50 per cent. for spares.		
42 Continental freight train locomotives at £20,000	£840,000	
Cost of 21 locomotives charged to English section		£420 000

FREIGHT TRAINS FOR SERVICE ON ENGLISH SECTION ONLY

1. *Waggons.*

Estimated annual earnings	£400,000	
or	96,000,000 pence.	
at 2*d.* per ton-mile equals... ...	48,000,000 ton-miles.	
Divided by 300 equals	160,000 ton-miles per day.	
Maidstone will be 33 miles from London, Ashford 51, and Monks Horton 57 miles. Traffic for destinations short of Maidstone will probably travel by road.		
Average length of haul is assumed to be	40 miles.	
160,000 ton-miles divided by mileage 40 equals	4,000 tons daily.	
At 25 tons per waggon, assuming length of travel only 40 miles per day, number of waggons required	160	
Waggons in sidings	500	
Spares	140	
Total	800	
Average price, including open coal waggons	£850	
Cost of 800 waggons at £850 ...		£680,000

2. *Locomotives.*

14 loaded waggons each weighing 50 tons gross, tare 25 tons, net load 25 tons, give a gross train load behind locomotive of	700 tons.	
160 waggons in 14-waggon trains require	12 locomotives.	
Averaging express and stopping goods trains, a locomotive with train will easily cover the distance of 57 miles from London to Monks Horton four times in 24 hours, therefore number of locomotives required is 3, say	4 locomotives.	
4 locomotives.		
2 add 50 per cent. for spares.		
6 locomotives at £20,000		£120,000

Diesel electric locomotives.

8 1st class at £18,000	£144,000	
8 2nd class at £4,000	32,000	
		£176,000

ENGLISH SUMMARY.

Passenger trains :	
London to Continent	£1,120,000
Outer Suburban short trains	984,000
" " long trains	480,000
Suburban electric motor trains	1,296,000
Rail motors	54,000
Freight trains :	
London to Continent, waggons	300,000
" " locomotives	420,000
English district, waggons	680,000
" " locomotives	120,000
Diesel electric locomotives	176,000
Total	£5,630,000

FRENCH SECTION. PASSENGER TRAINS.

Trains Nos. 10 to 14, Paris–London.
" 15 to 17, Boulogne–London.
" 38 to 46, Paris–Boulogne–Wissant.

17 trains.
9 add 50 per cent. for spares.

26 trains at £80,000 ... ... £2,080,000

Trains Nos. 47 to 67 Paris–Amiens, and Amiens–Wissant.

21 trains.
11 add 50 per cent. for spares.

32 trains at £41,000 ... ... £1,312,000

Electric motor 3-car trains, Nos. 68 to 90, for Paris suburban district, also Boulogne district.

23 trains.
3 add three trains to make 3 6-car trains for rush hours.

26
13 add 50 per cent. for spares.

39 electric motor trains at £24.000 ... ... £936,000

Single-car rail motors.
4
2 add 50 per cent. for spares.

6 electric rail motors at £9,000	£54,000

FREIGHT TRAINS, THE CONTINENT TO LONDON.

Cost of 300 freight waggons charged to French section	£300,000
Cost of 21 locomotives charged to French section ...	£420,000

FREIGHT TRAINS FOR SERVICE ON FRENCH SECTION ONLY.

Estimated annual earnings	£650,000	
or	156,000,000 pence.	
at $1\frac{3}{4}d.$ per ton-mile equals ...	89,142,858 ton-miles.	
Divided by 300 equals	297,143 ton-miles per day.	
Amiens will be 73 miles from Paris, Boulogne 141, and Wissant–Marquise 150.		
The average haul will be assumed to be	70 miles	
297,143 ton-miles divided by mileage 70, equals	4,245 tons daily.	
At 25 tons per waggon, assuming movement of 70 miles per day, number of waggons required ...	170 waggons.	
Waggons in sidings	600 "	
Spares	330 "	
Total	1100 "	
Average price, including open coal waggons	£850	
Cost of 1100 waggons at £850 ...		£935,000
14 loaded waggons, each weighing 50 tons gross, tare 25 tons, net load 25 tons, give a gross train load behind locomotive of	700 tons.	
170 waggons in 14-waggon trains require	13 locomotives.	
Averaging express and stopping freight trains, locomotives should cover 150 miles per day, therefore number of locomotives required ...	7 locomotives.	
Add 50 per cent. for spares, making	11 "	
11 locomotives at £20,000 ...		£220,000
Diesel electric locomotives.		
16 1st class at £18,000	£288,000	
16 2nd class at £4,000	64,000	
		£352,000

FRENCH SUMMARY.

Passenger trains :	
Paris–London, Boulogne–London, and Paris–Boulogne	£2,080,000
Paris–Amiens, etc.	1,312,000
Paris suburban and Boulogne district motor trains ...	936,000
Rail motors	54,000
Freight trains :	
Paris and Boulogne to London—	
waggons	300,000
locomotives	420,000
French district, waggons	935,000
„ „ locomotives	220,000
Diesel electric locomotives	352,000
Total	£6,609,000

APPENDIX IV

ESTIMATES FOR ENGLISH SECTION OF RAILWAY

		£	£
Land and Compensation			9,778,751
Viaducts :—South London, six lines, at £7 10*s.* per lineal yard per vertical foot		3,588,085	
Maidstone, four lines, 1148 yards, average height 109 feet at £5 per lineal yard per vertical foot ...		625,660	
			4,213,745
Tunnels :—Farningham, 1505 yards, West Yoke 3356 yards, Pettings 5524 yards, Chilston 2521 yards, total 12,906 yards, four lines, in two double-track tunnels at £300 per lineal yard		3,871,800	
Channel Tunnel approach 19,206 yards, two single-track tunnels at £150 per lineal yard ...		2,880,900	
			6,752,700
Embankments (including Stations and Sidings)	62,536,739 cubic yards		
Cuttings (including Stations and Sidings)	56,430,067 cubic yards at 2*s.* 2*d.* per cubic yard		6,113,258
Tunnel Spoil :—Channel Tunnel approach and half Channel Tunnel (23 ft. diameter)	3,709,992		
Other tunnels (sectional area 84 square yards)...	2,168,208		
Total Spoil	62,308,267 cubic yards		
Stations :—London Terminus, building and equipment		3,000,000	
London Goods Depot		1,000,000	
Maidstone £75,000, Ashford £75,000		150,000	
Ten Suburban at £25,000		250,000	
Fifteen Country at £10,000		150,000	
			4,550,000
Permanent Way, Masonry, Telegraphs and Signals :			
18 miles (six lines) with 10 flying or burrowing junctions at £120,000 per mile		2,160,000	
40 ,, (four lines) ,, 17 ,, ,, ,, ,, £ 80,000 ,, ...		3,200,000	
10 ,, 1606 yards (two lines) Channel Tunnel Approach at £ 40,000 ,, ...		440,000	
			5,800,000

Estimates for English Section of Railway, *continued.*

		£	£
Sidings:—Passenger Trains, 30 track miles at £4,000 per mile ...		120,000	
Goods Trains 30 ,, ,, ,, ,, ...		120,000	
			240,000
Permanent Way Electrical Equipment :			
18 miles (six lines) ...	108 track miles		
40 ,, (four lines) ...	160 ,, ,,		
10 ,, 1606 yards (two lines) ...	22 ,, ,,		
Passenger Train Sidings ...	30 ,, ,,		
½ mile Flying Junction for 28 stations ...	14 ,, ,,		
Extra lines for terminus ...	4 ,, ,,		
Total ...	338 track miles at £4,500 per mile ...	1,521,000	
3 Sub-stations each 10,000 K.W.=30,000 K.W. at £12·5 per K.W. ...		375,000	
50 miles of H.T. transmission at £5,000 per mile ...		250,000	
Sundry Equipment ...		200,000	
			2,346,000
Tube Junction with Northern lines ...			1,000,000
Rolling Stock ...			5,630,000
Hotel ...			250,000
Dwellings for dispossessed London tenants ...			1,000,000
Workshops, Plant and Cottages ...			500,000
Omnibuses and Delivery Vans ...			100,000
Legal, Surveying and Parliamentary Expenses ...			500,000
			48,774,454
Interest on Capital during construction: £48,774,454 at 5 per cent. for 4 years ...			9,754,891
Total ...			£58,529,345

APPENDIX V

ESTIMATES FOR FRENCH SECTION OF RAILWAY

		£	£
Land and Compensation ...			10,739,963
Viaducts, four lines :—Oise 3,248 yards, av. height 145 feet, Thérain 1202 yards, av. height 128 feet, Somme 3,060 yards, av. height 97 feet, Nièvre 1374 yards, av. height 152 feet, Authie 1698 yards, av. height 161 feet, Canche 2,395 yards, av. height 132 feet, Dordogne 440 yards, av. height 132 feet, Liane 1527 yards, av. height 132 feet, Wimereux 518 yards, av. height 108 feet; total 15,462 yards at £5 per lineal yard per vertical foot ...			10,177,950
Tunnels :—Cavillon 3329 yards, Noyers St. Martin 3,443 yards, Widehem 4,860 yards, Boulogne 219 yards, total 11,851 yards, four lines, in two double-track tunnels at £300 per lineal yard ...		3,555,300	
Channel Tunnel Approach, 15,672 yards, two single-track tunnels at £150 per lineal yard ...		2,350,800	
			5,906,100
Embankments (including Stations and Sidings) ...	220,441,634 cubic yards		
Cuttings (including Stations and Sidings) ...	223,297,942 cubic yards at 2*s*. 2*d*. per cubic yard		24,190,611
Tunnel Spoil :—Channel Tunnel Approach and half Channel Tunnel (23 ft. diameter) ...	3,384,864 cubic yards		
Other Tunnels (sectional area 84 square yards)	1,990,968		
Total Spoil ...	228,673,774 cubic yards		
Stations :—Paris Terminus, building and equipment ...		3,000,000	
Paris Goods Depot ,, ,, ...		750,000	
Amiens £50,000, Boulogne £250,000 ...		300,000	
Boulogne Goods Depot, building and equipment ...		250,000	
Ten Suburban at £25,000 ...		250,000	
Twenty-three Country, at £10,000 ...		230,000	
			4,780,000
Permanent Way, Masonry, Telegraphs and Signals :			
20 miles (six lines) with 10 flying or burrowing junctions at £120,000 per mile ...		2,400,000	
132 ,, (four lines) ,, 25 ,, ,, ,, ,, £ 80,000 ,, ...		10,560,000	
9 ,, (two lines) Channel Tunnel Approach at ... £ 40,000 ,, ...		360,000	
			13,320,000

ESTIMATES FOR FRENCH SECTION OF RAILWAY—*continued.*

		£	£
Sidings:—Passenger Trains, 45 track miles at £4,000 per mile		180,000	
Goods Trains, 55 „ „ „ „		220,000	
			400,000
Permanent Way Electrical Equipment:			
20 miles (six lines)	120 track miles		
132 „ (four lines)	528 „ „		
9 „ (two lines)	18 „ „		
Passenger Train Sidings	45 „ „		
½ mile flying junction for 36 stations	18 „ „		
Extra lines for Terminus... ...	4 „ „		
Total	733 track miles at £4,500 per mile	3,298,500	
5 Sub-stations, each 10,000 K.W.=50,000 K.W. at £12·5 per K.W.		625,000	
150 miles H.T. transmission at £5,000 per mile		750,000	
Sundry equipment		300,000	
			4,973,500
Junction with Chemin de fer de la Ceinture			250,000
Rolling Stock			6,609,000
Hotel			250,000
Dwellings for dispossessed Paris tenants			500,000
Workshops, Plant and Cottages			500,000
Omnibuses and delivery vans			100,000
Legal, Surveying and Parliamentary Expenses			500,000
			83,197,124
Interest on capital during Construction, £83,197,124 at 5 per cent. for 4 years			16,639,425
Total			£99,836,549

Q

APPENDIX VI

ESTIMATES FOR CHANNEL TUNNEL AND SUMMARY

	£
Excavation and Lining of two separate Tunnels, 24 miles in length, H.W.M. to H.W.M.	24,000,000
Permanent Way, Telegraphs and Signals, 24 miles at £40,000 per mile	960,000
Permanent Way Electrical Equipment, 24 miles=48 track miles at £4,500 per mile	216,000
Acquisition of Channel Tunnel Companies	500,000
	25,676,000
Interest on Capital during Construction, £25,676,000 at 5 per cent. for 4 years	5,135,200
Total	£30,811,200

SUMMARY

	£
Estimated Cost of English Section	58,529,345
Estimated Cost of French Section	99,836,549
Estimated Cost of Channel Tunnel	30,811,200
Total Estimated Cost	£189,177,094

SUMMARY, MISCELLANEOUS

Gauge	7 feet
Mileage, England	68 miles 1,606 yards
Channel Tunnel, H.W.M. to H.W.M.	23 ,, 1,200 ,,
France	160 ,, 880 ,,
	253 miles 166 yards
Time occupied between London and Paris	2 hours 45 minutes
Average speed	92 miles per hour
Time occupied between London and Boulogne	1 hour 25 minutes
Average speed	79 miles per hour

APPENDIX VII

DRAFT TIME-TABLES

1. LONDON AND ASHFORD TO THE CONTINENT

TRAIN No.	1	7	2	3	8	4	5	9	7	6	15	10	11	16	9	12	17	13	14	7	1	2
London ... ... dep.	5.15	6 35	7.10	7.45	8.10	8.30	9.15	9.25	...	10. 0	10.30	10.45	11.30	12. 5	...	12.40	13.20	13.30	14. 0	14.30	14.45	15.30
Ashford ... ... dep.	slip	...	...	...	...	...	...	...	10. 5	...	...	...	...	...	12.52	...	...	...	...	...	...	...
Boulogne ... ... arr.	6.40	8. 0	...	...	9.35	...	...	10.50	11. 0	...	11.55	...	...	13.30	13.47	...	14.45	...	...	15.55	...	...
Paris ... ... arr	8. 0	...	9.55	10.30	...	11.15	12. 0	...	...	12.45	...	13.30	14.15	...	...	15.25	...	16.15	16.45	...	17.30	18.15

TRAIN No.	16	3	8	4	5	9	6	10	7	15	11	12	17	13	14	16						
London ... ... dep.	...	16. 0	16.10	16.30	17. 0	17.10	17.45	18.15	...	18.45	19.15	20. 0	20.30	22. 0	23.50	0. 0	...	...	...	...	...	...
Ashford ... ... dep.	16. 5	...	...	...	...	...	...	...	18.50	...	...	...	...	...	...	...	...	...	...	...	...	...
Boulogne ... ... arr.	17. 0	...	17.35	...	...	18.35	...	...	19.45	20.10	...	...	21.55	...	...	1.25	...	...	...	...	...	...
Paris ... ... arr.	...	18.45	...	19.15	19.45	...	20.30	21. 0	...	...	22. 0	22.45	...	0.45	2.35	...	...	...	...	...	...	...

2. THE CONTINENT TO ASHFORD AND LONDON

TRAIN No.	10	15	11	16	7	12	17	13	14	1	9	7	2	3	8	4	5	16	9	6	10	15
Paris ... ... dep.	5.15	...	7. 0	...	...	7.45	...	8.30	9.15	10. 5	...	...	10.40	11.30	...	12.15	13. 5	...	...	13.45	14.30	...
Boulogne ... ... dep.	...	7.30	...	8.35	8.45	...	9.30	...	...	...	11.40	11.50	...	...	13.20	...	...	14.40	14.55	...	...	16. 5
Ashford ... ... arr.	...	...	...	...	9.40	...	...	...	...	...	12.35	...	...	...	...	...	...	15.35	...	...	...	...
London ... ... arr.	8. 0	8.55	9.45	10. 0	...	10.30	10.55	11.15	12. 0	12.50	...	13.15	13.25	14.15	14.45	15. 0	15.50	...	16.20	16.30	17.15	17.30

TRAIN No.	11	17	12	7	16	13	14	1	7	2	3	8	4	5	9	6						
Paris ... ... dep.	15.15	...	16.0	...	...	16.45	17.30	18.15	...	18.55	19.45	...	20.30	22.0	...	0. 0	...	...	...	...	...	...
Boulogne ... ... dep.	...	17. 0	...	17.40	17.55	...	...	...	20. 0	...	...	21.20	...	...	23.40	...	...	...	...	...	...	...
Ashford ... ... arr.	...	...	...	18.35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
London ... ... arr.	18. 0	18.25	18.45	...	19.20	19.30	20.15	21. 0	21.25	21.40	22.30	22.45	23.15	0.45	1. 5	2.45	...	...	...	...	...	...

3. ENGLISH SECTION DOWN TRAINS

TRAIN No. ... ... / PLATFORM		1 M	32 OS	36 OS	33 OS	7 M	34 OS	2 M	37 OS	3 M	19 OS	RM	18 OS	8 M	4 M	32 OS	27 OS	36 OS	29 OS	35 M	22 OS	20 OS	7	28 OS
London ...	... dep.	5.15	5.30	5.55	6.30	6.35	7. 0	7.10	7.10	7.45	8. 0	...	8. 5	8.10	8.30	8.33	8.38	8.45	8.50	9. 0	9. 0	9. 5	...	9.10
Farningham ...	... arr.	↓	↓	6.13	↓	↓	↓	↓	7.28	↓	↓	...	8.23	↓	↓	↓	↓	↓	↓	↓	↓	↓	...	↓
	... dep.	↓	↓	6.15	↓	↓	↓	↓	7.30	↓	↓	...	8.25	↓	↓	↓	↓	↓	↓	↓	↓	↓	...	↓
Fawkham Green	... ,,	↓	↓	6.20	↓	↓	↓	↓	7.35	↓	↓	...	8.30	↓	↓	↓	↓	↓	↓	↓	↓	↓	...	↓
Ridley	... ,,	↓	↓	6.24	↓	↓	↓	↓	7.39	↓	↓	...	8.34	↓	↓	↓	↓	↓	↓	↓	↓	↓	...	↓
Trottiscliffe ...	... ,,	↓	↓	6.30	↓	↓	↓	↓	7.45	↓	↓	...	8.40	↓	↓	↓	9. 0	↓	↓	↓	↓	↓	...	9.32
Addington ...	... ,,	↓	↓	6.32	↓	↓	↓	↓	7.47	↓	↓	...	8.42	↓	↓	↓	...	↓	↓	↓	↓	↓	...	...
Leybourne ...	... ,,	↓	↓	6.35	↓	↓	↓	↓	7.50	↓	↓	...	8.45	↓	↓	↓	...	↓	↓	↓	↓	↓	...	...
Preston Hall ...	... ,,	↓	↓	6.41	↓	↓	↓	↓	7.56	↓	↓	...	8.51	↓	↓	↓	...	↓	↓	↓	↓	↓	...	...
Maidstone ...	... arr.	↓	5.57	6 45	6.57	↓	7.27	↓	8. 0	↓	8.27	...	8.55	↓	↓	9. 0	...	↓	↓	↓	9.27	9.32	...	...
	... dep.	↓	6. 0	...	7. 0	↓	7.30	↓	...	↓	8.30	8.33	...	↓	↓	9. 1	...	↓	↓	↓	9.29	...	...	...
Bearsted ...	... ,,	↓	↓	...	7. 4	↓	↓	↓	...	↓	↓	8.37	...	↓	↓	↓	...	↓	↓	↓	...	...	...	...
Leeds Castle ...	... ,,	↓	↓	...	7. 9	↓	↓	↓	...	↓	↓	8.42	...	↓	↓	↓	...	↓	↓	↓	9.36	...	...	...
Harrietsham ...	... ,,	↓	↓	...	7.13	↓	↓	↓	...	↓	↓	8.46	...	↓	↓	↓	...	↓	9.20	↓	...	...	...	...
Chilston ...	... ,,	↓	↓	...	7.19	↓	↓	↓	...	↓	↓	8.52	...	↓	↓	↓	...	↓	9.26	↓	9.44	...	...	...
Little Chart ...	... ,,	↓	↓	...	7.25	↓	↓	↓	...	↓	↓	8.58	...	↓	↓	↓	...	↓	...	↓	9.50	...	...	...
Hothfield ...	... ,,	↓	↓	...	7.29	↓	↓	↓	...	↓	↓	9. 1	...	↓	↓	↓	...	↓	...	↓	9.54	...	...	...
Ashford ...	... arr.	↓	6.18	...	7.35	↓	7.48	↓	...	↓	8.48	9. 6	...	↓	↓	↓	...	↓	...	↓	10. 0	...	...	...
	... dep.	↓	6.20	...	7.37	↓	7.50	↓	...	↓	8.50	9. 7	...	↓	↓	↓	...	↓	...	↓	10. 2	...	10. 5	...
Willesborough ...	... ,,	↓	...	...	7.41	↓	...	↓	...	↓	...	9.11	...	↓	↓	↓	...	↓	...	↓	10. 6	...	↓	...
Brabourne ...	... ,,	↓	...	...	7.46	↓	...	↓	...	↓	...	9.16	...	↓	↓	↓	...	↓	...	↓	10.11	...	↓	...
Monks Horton	... arr.	↓	6.30	...	7.50	↓	8. 0	↓	...	↓	9. 0	9.20	...	↓	↓	9.25	...	9.30	...	9.40	10.15	...	↓	...
		slip				↓		↓		↓				↓	↓								↓	
Boulogne ...	... arr.	6.40	...	...	...	8. 0	...	↓	...	↓	...	...	...	9.35	↓	...	...	...	...	...	...	...	11. 0	...
Paris	... arr.	8. 0	...	...	...	...	...	9.55	...	10.30	...	...	...	...	11.15	...	...	...	...	...	...	...	...	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

3. ENGLISH SECTION DOWN TRAINS—*continued.*

TRAIN No. ... ... / PLATFORM	RM	21 OS	5 M	37 OS	9 M	30 OS	6 M	34 OS	RM	18 OS	15 M	10 M	32 M	19 OS	37 OS	11 M	35 OS	16 M	9	RM	30 OS	12 M	21 M
London ... ... dep.	...	9.13	9.15	9.20	9.25	9.25	10. 0	10. 0	...	10.25	10.30	10.45	11. 0	11. 0	11.25	11.30	12. 0	12. 5	...	...	12.25	12.40	13. 0
Farningham ... ... arr.	9.30	9.36		9.40		9.43			...	10.43				11.18	11.43				...	...	12.43		
Farningham ... ... dep.	9.31	9.37		9 41		9.45			...	10.45				11.20	11.45				...	...	12.45		
Fawkham Green ... ,,	9.36	...				9.50			...	10.50					11.50				...	...	12.50		
Ridley ... ... ,,	...	Calls at				9.54			...	10.54					11.54				...	...	12.54		
Trottiscliffe ... ... ,,	...	9.27				10. 0			...	11. 0					12. 0				...	...	13. 0		
Addington ... ... ,,	...	Sidcup				10. 2			...	11. 2					12. 2				...	...	13. 2		
Leybourne ... ... ,,	...	...		9.55		10. 5			...	11. 5					12. 5				...	...	13. 5		
Preston Hall ... ... ,,	...	...		9.59		10.11			...	11.11					12.11				...	...	13.11		
Maidstone ... ... arr.	...	9.55		10. 5		10.15		10.27	...	11.15				11.37	12.15		12.27		...	...	13.15		
Maidstone ... ... dep.	...	10. 0		...		...		10.30	10.35	...				11.40	...		12.30		...	12.35	...		
Bearsted ... ... ,,	...			...		...			10.39	...				11.44	...				...	12.39	...		
Leeds Castle ... ... ,,	...			...		...			10.44	...				11.49	...				...	12.44	...		
Harrietsham ... ... ,,	...			...		...			10.48	...				11.53	...				...	12.48	...		
Chilston ... ... ,,	...			...		...			10.54	...				11.59	...				...	12.54	...		
Little Chart ... ... ,,	...			...		...			11. 0	...				12. 5	...				...	13. 0	...		
Hothfield ... ... ,,	...			...		...			11. 4	...				12. 9	...				...	13. 4	...		
Ashford ... ... arr.	...	10.18		...		...		10.48	11.10	...				12.15	...		12.48		...	13.10	...		
Ashford ... ... dep.	...	10.20		...		...		10.50	11.12	...				12.17	...		12.50		12.52	13.12	...		
Willesborough ... ... ,,	...	...		...		...		...	11.16	...				12.21	...		...			13.16	...		
Brabourne ... ... ,,	...	...		...		...		...	11.21	...				12.26	...		...			13.21	...		
Monks Horton ... arr.	...	10.30		...		...		11. 0	11.25	...			11.40	12.30	...		13. 0			13.25	...		13.40
Boulogne ... ... arr.	...	...		...	10.50	...		...	...	...	11.55		...	...	...		...	13.30	13.47	...	...		...
Paris ... ... arr.	...	...	12. 0	...	...	...	12.45	...	...	...	...	13.30	...	...	...	14.15	...	...	...	...	...	15.25	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

3. ENGLISH SECTION DOWN TRAINS—*continued.*

Train No. ... ... / Platform		22 OS	17 M	18 OS	13 M	14 M	34 OS	R M	37 OS	7 M	1 M	19 M	32 OS	30 OS	2 M	16	3 M	35 OS	R M	8 M	4 M	22 OS	21 OS	18 OS
London ...	... *dep.*	13. 0	13.20	13.25	13.30	14. 0	14. 0	...	14 25	14.30	14.45	15. 0	15. 0	15.25	15.30	...	16. 0	16. 0	...	16.10	16.30	16.30	16.35	16.40
Farningham ...	... *arr.*			13.43				...	14.43				15.18	15.43		...			...					
	dep.			13.45				...	14.45				15.20	15.45		...			...					
Fawkham Green	... ,,			13.50				...	14.50					15.50		...			...					
Ridley	... ,,			13.54				...	14.54					15.54		...			...					
Trottiscliffe ...	... ,,			14. 0				...	15. 0					16. 0		...			...					
Addington ...	... ,,			14. 2				...	15. 2					16. 2		...			...					
Leybourne ...	... ,,			14. 5				...	15. 5					16. 5		...			...					
Preston Hall ...	... ,,			14.11				...	15.11					16.11		...			...					
Maidstone ...	... *arr.*	13.27		14.15			14.27	...	15.15				15.37	16.15		...		16.27	...					
	dep.	13.30		...			14.30	14.35	...				15.40	...		...		16.30	16.33					
Bearsted ...	... ,,	13.34		...				14.39	...				15.44	...		...			...					
Leeds Castle ...	... ,,	13.39		...				14.44	...				15.49	...		...			16.39					
Harrietsham ...	... ,,	13.43		...				14.48	...				15.53	...		...			...					
Chilston ...	... ,,	13.49		...				14.54	...				15.59	...		...			16.46					17.13
Little Chart ...	... ,,	13.55		...				15. 0	...				16. 5	...		...			...					17.19
Hothfield ...	... ,,	13.59		...				15. 4	...				16. 9	...		...			...					17.23
Ashford ...	... *arr.*	14. 5		...			14.48	15.10	...				16.15	...		...		16.48	16.57				17.12	17.29
	dep.	14. 7		...			14.50	15.12	...				16.17	...		16. 5		16.50	...				17.15	...
Willesborough ...	... ,,	14.11		...			...	15.16	...				16.21	...				...	...				17.20	...
Brabourne ...	... ,,	14.16		...			...	15.21	...				16.26	...				...	...				17.25	...
Monks Horton	... *arr.*	14.20		...			15. 0	15.25	...			15.40	16.30	...				17. 0	...			17.10	17.30	...
Boulogne ...	... *arr.*	...	14.45	...			...	...	...	15 55		...	...	...		17. 0		...	...	17.35		...	...	...
Paris	... *arr.*	...	...	...	16.15	16.45	...	...	...	...	17.30	...	...	...	18.15	...	18.45	...	...	...	19.15	...	...	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

3. ENGLISH SECTION DOWN TRAINS—*continued.*

Train No. ... ... / Platform	37 OS	36 OS	27 OS	5 M	9 M	23 OS	34 OS	24 OS	31 OS	25 OS	28 OS	6 M	32 M	26 OS	19 OS	10 M	29 OS	30 OS	27 OS	7	37 OS	15 M	18 OS
London ... ... dep.	16.45	16.50	16.55	17. 0	17.10	17.15	17.20	17.25	17.30	17.35	17.40	17.45	18. 0	18. 5	18.10	18.15	18.15	18.20	18.25		18.40	18.45	18.45
Farningham ... ... arr.			...								...								...	...			...
dep.			...								...								...	...			...
Fawkham Green ... ,,			17.15								18. 0								18.45	...			19. 5
Ridley ... ... ,,			17.19								18. 4								18.49	...			19. 9
Trottiscliffe ... ... ,,			17.25								18.10								18.55	...			19.15
Addington ... ... ,,		17.14	...							17.59	18.12							18.44	18.58	...	19. 4		...
Leybourne ... ... ,,		17.18	...							18. 3	18.15							18.48	...	...	19. 8		...
Preston Hall ... ... ,,		17.23	...							18. 8	18.21							18.53	...	...	19.13		...
Maidstone ... ... arr.	17.12	17.28	...						17.57	18.13	18.25						18.42	18.58	...	...	19.18		19.25
dep.	17.15	...	...						18. 0	18.15	...						18.45	19. 0	...	...	...		...
Bearsted ... ... ,,	17.19	...	...						18. 4		...						18.49		...	...	...		...
Leeds Castle ... ... ,,	17.24	...	...						18. 9		...						18.54		...	...	...		...
Harrietsham ... ... ,,	17.28	...	...						18.13		...						18.58		...	...	...		...
Chilston ... ... ,,	...	...	...					17.58	18.19		...				18.43		19. 4	19.12	...	...	...		...
Little Chart ... ... ,,	...	...	...					18. 4	...		...				18.49		...	...	...	...	...		...
Hothfield ... ... ,,	...	...	...					18. 8	...		...				18.53		...	...	...	...	...		...
Ashford ... ... arr.	...	...	...				17.57	18.14	...	18.32	...			18.42	18.59		...	...	...	...	...		...
dep.	...	...	...				18. 0	18.15	...	18.35	...			18.45	19. 0		...	...	...	18.50	...		...
Willesborough ... ,,	...	...	...				18. 5	...	...	...	...			18.50	...		...	...	...		...		...
Brabourne ... ... ,,	...	...	...				18.10	...	...	...	...			18.55	...		...	...	...		...		...
Monks Horton ... arr.	...	...	...			17.55	18.15	18.25	...	18.45	...		18.40	19. 0	19.10		...	...	...		...		...
Boulogne ... ... arr.	...	...	...		18.35	...	...	...	...	...	...		...	...	...		...	...	...	19.45	...	20.10	...
Paris ... ... arr.	...	...	...	19.45	...	...	...	...	...	...	...	20.30	...	...	...	21. 0	...	...	...	...	...	...	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor

3. ENGLISH SECTION DOWN TRAINS—*continued.*

Train No. ... ... / Platform		35 OS	20 OS	11 M	36 OS	12 M	22 OS	R M	28 OS	17 M	23 M	34 OS	37 OS	13 M	26 OS	R M	36 OS	28 OS	19 M	22 OS	14 M	22	23 OS	16 M
London ...	... dep.	19. 0	19. 5	19.15	19.25	20. 0	20. 0	...	20.25	20.30	21. 0	21. 0	21.25	22. 0	22. 0	...	22.25	23.10	23.40	23.45	23.50	...	23.50	0.0
Farningham ...	... arr.	↓	↓	↓	19.43	↓	20.18	...	20.43	↓	↓	21.18	21.43	↓	↓	...	22.43	23.28	↓	↓	↓	...	0. 8	↓
	dep.	↓	↓	↓	19.45	↓	20.20	...	20.45	↓	↓	21.20	21.45	↓	↓	...	22.45	23 30	↓	↓	↓	...	0.10	↓
Fawkham Green	... ,,	↓	↓	↓	19.50	↓	↓	...	20.50	↓	↓	↓	21.50	↓	↓	...	22.50	23.35	↓	↓	↓	...	0.15	↓
Ridley ...	... ,,	↓	↓	↓	19.54	↓	↓	...	20.54	↓	↓	↓	21.54	↓	↓	...	22.54	23.39	↓	↓	↓	...	0.19	↓
Trottiscliffe ...	... ,,	↓	↓	↓	20. 0	↓	↓	...	21. 0	↓	↓	↓	22. 0	↓	↓	...	23. 0	23.45	↓	↓	↓	...	0.25	↓
Addington ...	... ,,	↓	↓	↓	20. 2	↓	↓	...	21. 2	↓	↓	↓	22. 2	↓	↓	...	23. 2	23.47	↓	↓	↓	...	0.27	↓
Leybourne ...	... ,,	↓	↓	↓	20. 5	↓	↓	...	21. 5	↓	↓	↓	22. 5	↓	↓	...	23. 5	23 50	↓	↓	↓	...	0.30	↓
Preston Hall ...	... ,,	↓		↓	20.11	↓		...	21.11	↓	↓		22.11	↓		...	23.11	23.55	↓		↓	...	0.36	↓
Maidstone ...	... arr.	↓	19.32	↓	20.15	↓	20.37	...	21.15	↓	↓	21.37	22.15	↓	22.27	...	23.15	0. 0	↓	0.12	↓	...	0.40	↓
	dep.	↓	19.35	↓	...	↓	20.40	20.45	...	↓	↓	21.40	...	↓	22.30	22.35	...	...	↓	0.15	↓	0.20	0.43	↓
Bearsted ...	... ,,	↓	19.39	↓	...	↓	↓	20.49	...	↓	↓	21.44	...	↓	↓	22.39	...	...	↓	↓	↓	0.24	↓	↓
Leeds Castle ...	... ,,	↓	19.44	↓	...	↓	↓	20.54	...	↓	↓	21.49	...	↓	↓	22.44	...	...	↓	↓	↓	0.29	↓	↓
Harrietsham ...	... ,,	↓	19.48	↓	...	↓	↓	20.58	...	↓	↓	21.53	...	↓	↓	22.48	...	...	↓	↓	↓	0.33	↓	↓
Chilston ...	... ,,	↓	19.54	↓	...	↓	↓	21. 4	...	↓	↓	21.59	...	↓	↓	22.54	...	...	↓	↓	↓	0.39	↓	↓
Little Chart ...	... ,,	↓	20. 0	↓	...	↓	↓	21.10	...	↓	↓	22. 5	...	↓	↓	23. 0	...	...	↓	↓	↓	0.45	↓	↓
Hothfield ...	... ,,		20. 4	↓	...	↓		21.14	...	↓	↓	22. 9	...	↓		23. 4	...	...	↓		↓	0.49		↓
Ashford ...	... arr.	19.37	20.10	↓	...	↓	20.58	21.20	...	↓	↓	22.15	...	↓	22.48	23.10	...	...	↓	0.33	↓	0.55	1. 2	↓
	dep.	19.40	20.12	↓	...	↓	21. 0	21.22	...	↓	↓	22.17	...	↓	22.50	23.12	...	...	↓	0.35	↓	0.57	1. 5	↓
Willesborough ...	... ,,	...	20.16	↓	...	↓	...	21.26	...	↓	↓	22.21	...	↓	...	23.16	...	...	↓	...	↓	1. 1	...	↓
Brabourne ...	... ,,	...	20.21	↓	...	↓	...	21.31	..	↓		22.26	...	↓	...	23.21	...	...		...	↓	1. 6	...	↓
Monks Horton	... arr.	19.50	20.25	↓	...	↓	21.10	21.35	...	↓	21.40	22.30	...	↓	23. 0	23.25	...	...	0.20	0.45	↓	1.10	1.15	↓
Boulogne ...	... ,,	...	...		...		...	...	...	21.55	...	...	...		...	...	...	...	...	...		...	...	1.25
Paris... ...	... ,,	...	...	22. 0	...	22.45	...	...	...	...	...	...	...	0.45	...	...	...	...	...	...	2.35	...	...	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

4. ENGLISH SECTION UP TRAINS

Train No.		18	19	10	32	27	36	R M	29	20	21	22	15	28	37	30	33	34	23	27	18	31	24	25	11
Paris	... dep.	...	...	5.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7. 0
Boulogne ...	... ,,	...	...		...	...	...	...	...	...	...	...	7.30	...	...	...	...	...	...	...	...	...	...	...	
Monks Horton	... ,,	...	6.30		7.10	...	...	7.15	...	7.43	7.55	8. 0		...	...	...	8.18	8.30	8.30	...	...	...	8.53	8.55	
Brabourne ...	... ,,	...	6.34		...	...	...	7.19	...	...	7.59			...	...	...	...		8.34	...	...	...	...		
Willesborough	... ,,	...	6.39		...	...	...	7.24	...	...	8. 4			...	...	...	...		8.39	...	...	...	...		
Ashford ...	... arr.	...	6.43		7.20	...	...	7.28	...	7.53	8. 9			...	...	...	8.28		8.44	...	...	...	9. 3		
	dep.	...	6.45		7.22	...	...	7.30	...	7.56	8.12			...	...	...	8.31		8.47	...	...	...	9. 6		
Hothfield ...	... ,,	...	6.51			...	...	7.36	...	8. 2				...	...	...	8.37			...	...	...	9.12		
Little Chart ...	... ,,	...	6.55			...	...	7.40	...	8. 6				...	...	...	8.41			...	...	...	9.16		
Chilston ...	... ,,	...	7. 1			...	...	7.46	7.51	8.12				...	...	8.26	8.47			...	...	9. 1	9.22		
Harrietsham ...	... ,,	...	7. 7			...	...	7.52	7.57					...	...	8.32				...	...	9. 7			
Leeds Castle ...	... ,,	...	7.11			...	...	7.56	8. 1					...	...	8.36				...	...	9.11			
Bearsted ...	... ,,	...	7.16			...	...	...	8. 6					...	...	8.41			slip	...	...	9.16			
Maidstone ...	... arr.	...	7.20		7.40	...	...	8. 3	8.10					...	...	8.45			9. 5	...	...	9.20			
	dep.	6.45	7.23		7.43	...	7.57	...	8.13					...	8.32	8.48				...	...	9.23			
Preston Hall ...	... ,,	6.49				...	8. 2	...						...	8.37					...	9. 7				
Leybourne ...	... ,,	6.55				...	8. 7	...						...	8.42					..	9.12				
Addington ...	... ,,	6.58				...	8.11	...						...	8.46					...	9.17				
Trottiscliffe ...	... ,,	7. 0				8. 0		...						8.35						9.10	9.21				
Ridley	... ,,	7. 6				8. 6		...						8.41						9.16					
Fawkham Green	... ,,	7.10				8.10		...						8.45						9.20					
Farningham ...	... arr.	7.15				...		...						...						...					
	dep.	7.17				...		...						...						...					
London ...	... arr.	7.35	7.50	8. 0	8.10	8.30	8.35	...	8.40	8.45	8.50	8.40	8.55	9. 5	9.10	9.15	9.20	9.10	9.25	9.40	9.45	9.50	9.55	9.35	9.45
Platform		OS	OS	M	OS	OS	OS		OS	OS	OS	M	M	OS	OS	OS	OS	M	OS	OS	OS	OS	OS	M	M

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R. M.**—Rail Motor.

4. ENGLISH SECTION UP TRAINS—*continued.*

Train No.	16	26	7	RM	28	20	29	RM	19	32	12	36	17	37	35	13	30	22	21	14	18	1	RM	34
Paris ... ... *dep.*	...	...	...	...	...	...	...	...	...	...	7.45	...	...	...	...	8.30	...	...	...	9.15	...	10. 5	...	...
Boulogne ... ... ,,	8.35	...	8.45	...	...	...	...	...	...	...		...	9.30	...	...		...	...	...		...		...	...
Monks Horton... ... ,,		9. 5		...	...	...	...	9.25	9.28	9.35		9.40		...	10. 0		...	10.40	11. 0		...		11.30	12. 0
Brabourne ... ... ,,		9. 9		...	...	...	...		...			9.44		...	...		...	10.44			...		11.34	...
Willesborough ... ... ,,		9.14		...	...	...	...		...			9.49		...	...		...	10.49			...		11.39	...
Ashford ... ... *arr.*		9.19	9.40	...	...	...	...		9.38			9.54		...	10.10		...	10.53			...		11.43	12.10
Ashford ... ... *dep.*		9.22	...	...	...	...	...		9.41			9.57		...	10.13		...	10.55			...		11.45	12.13
Hothfield ... ... ,,			...	...	...	...	...		9.47					...			...	11. 1			...		11.51	
Little Chart ... ... ,,			...	...	...	...	...		9.51					...			...	11. 5			...		11.55	
Chilston ... ... ,,			...	...	...	...	9.36	9.41	9.57					...			...	11.11			...		12. 1	
Harrietsham ... ... ,,			...	...	...	...	9.42	9.47						...			...	11.17			...		12. 7	
Leeds Castle ... ... ,,			...	...	...	...	9.46	9.51						...			...	11.21			...		12.11	
Bearsted ... ... ,,			...	...	...	...	9.51	9.56						...			...	11.26			...		12.16	
Maidstone ... ... *arr.*			...	...	...	...	9.55	10. 0						...	10.30		...	11.30			...		12.20	12.30
Maidstone ... ... *dep.*			...	...	...	9.42	9.58	...						10.15	10.33		10.45	11.33			11.45		...	12.33
Preston Hall ... ... ,,			...	...	...	9.47		...						...			10.49				11.49		...	
Leybourne ... ... ,,			...	...	...	9.52		...						10.22			10.55				11.55		...	
Addington ... ... ,,			...	...	...	9.56		...						...			10.58				11.58		...	
Trottiscliffe ... ... ,,			...	...	9.45			...						...			11. 0				12. 0		...	
Ridley ... ... ,,			...	...	9.51			...						10.31			11. 6				12. 6		...	
Fawkham Green ... ,,			...	9.50	9.55			...						10.35			11.10				12.10		...	
Farningham ... ... *arr.*			...	9.55	...			...						...			11.15	11.50			12.15		...	
Farningham ... ... *dep.*			...	...	...			...						...			11.17	11.52			12.17		...	
London ... ... *arr.*	10. 0	10. 0	...	...	10.15	10.20	10.25	...	10.30	10.15	10.30	10.35	10.55	10.55	11. 0	11.15	11.35	12.10	11.40	12. 0	12.35	12.50	...	13. 0
Platform	**M**	**OS**			**OS**	**OS**	**OS**		**OS**	**M**	**M**	**OS**	**M**	**OS**	**OS**	**M**	**OS**	**OS**	**M**	**M**	**OS**	**M**		**OS**

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

4. ENGLISH SECTION UP TRAINS—*continued.*

Train No.		9	7	2	37	32	19	3	30	8	RM	4	35	18	21	22	5	16	9	6	37	RM	34	10
Paris	... dep.	...	...	10.40	...	...	...	11.30	...	...	...	12.15	...	...	...	...	13. 5	...	...	13.45	...	...	...	14.30
Boulogne ...	... ,,	11.40	11.50		...	...	...		...	13.20	...		...	...	...	...		14.40	14.55		...	...	...	
Monks Horton	... ,,				...	12.40	13. 0		...		13.30		14. 0	...	14.40	15. 0					...	15.35	16. 0	
Brabourne ...	... ,,				...	12.44			...		13.34		...	...	14.44						...	15.39	...	
Willesborough ...	... ,,				...	12.49			...		13.39		...	...	14.49						...	15.44	...	
Ashford	... arr.	12.35			...	12.53			...		13.43		14.10	...	14.53			15.35			...	15.48	16.10	
	dep.	...			...	12.55			...		13.45		14.13	...	14.55			...			...	15.50	16.13	
Hothfield ...	... ,,	...			...	13. 1			...		13.51			...	15. 1			...			...	15.56		
Little Chart ...	... ,,	...			...	13. 5			...		13.55			...	15. 5			...			...	16. 0		
Chilston ...	... ,,	...			...	13.11			...		14. 1			...	15.11			...			...	16. 6		
Harrietsham ...	... ,,	...			...	13.17			...		14. 7			...	15.17			...			...	16.12		
Leeds Castle ...	... ,,	...			...	13.21			...		14.11			...	15.21			...			...	16.16		
Bearsted ...	... ,,	...			...	13.26			...		14.16			...	15.26			...			...	16.21		
Maidstone ...	... arr.	...			...	13.30			...		14.20		14.30	...	15.30			...			...	16.25	16.30	
	dep.	...			12.45	13.33			13.45		...		14.33	14.45	15.33			...			15.45	...	16.33	
Preston Hall ...	... ,,	...			12.49				13.49		...			14.49				...			15.49	...		
Leybourne ...	... ,,	...			12.55				13.55		...			14.55				...			15.55	...		
Addington ...	... ,,	...			12.58				13.58		...			14.58				...			15.58	...		
Trottiscliffe ...	... ,,	...			13. 0				14. 0		...			15. 0				...			16. 0	...		
Ridley	... ,,	...			13. 6				14. 6		...			15. 6				...			16. 6	...		
Fawkham Green	... ,,	...			13.10				14.10		...			15.10				...			16.10	...		
Farningham ...	... arr.	...			13.15				14.15		...			15.15	15.50			...			16.15	...	16.50	
	dep.	...			13.17				14.17		...			15.17	15.52			...			16.17	...	16.52	
London ...	... arr.	...	13.15	13.25	13.35	14. 0	13.40	14.15	14.35	14.45	...	15. 0	15. 0	15.35	16.10	15.40	15.50	...	16.20	16.30	16.35	...	17.10	17.15
Platform			M	M	OS	OS	M	M	OS	M		M	OS	OS	OS	M	M		M	M	OS		OS	M

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

4. ENGLISH SECTION UP TRAINS—*continued.*

Train No.		15	30	27	19	32	11	37	18	35	17	12	36	22	7	16	13	28	27	23	34	RM	32	14
Paris	... dep.	...	...	...	...	...	15.15	...	...	...	...	16. 0	...	...	...	...	16.45	...	...	...	...	...	...	17.30
Boulogne ...	... ,,	16. 5	...	...	...	...	↓	...	...	...	17. 0	↓	...	...	17.40	17.55	↓	...	...	...	...	...	...	↓
Monks Horton...	... ,,	↓	...	...	16.40	17. 0	↓	...	...	17.35	↓	↓	...	17.45	↓	↓	↓	...	...	18.35	18.40	19.25	19.30	↓
Brabourne ...	... ,,	↓	...	...	16.44	↓	↓	...	...	↓	↓	↓	...	17.50	↓	↓	↓	...	...	18.39	18.44	19.29	↓	↓
Willesborough ...	... ,,	↓	...	...	16.49	↓	↓	...	...	↓	↓	↓	...	17.55	↓	↓	↓	...	...	18.44	18.49	19.34	↓	↓
Ashford... ...	... arr.	↓	...	...	16.53	↓	↓	...	...	↓	↓	↓	...	18. 0	18.35	↓	↓	...	...	18.48	18.53	19.38	↓	↓
	dep.	↓	...	...	16.55	↓	↓	...	17.33	↓	↓	↓	...	18. 3	...	↓	↓	...	...	18.50	18.55	19.40	↓	↓
Hothfield ...	... ,,	↓	...	...	17. 1	↓	↓	...	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19. 1	19.46	↓	↓
Little Chart ...	... ,,	↓	...	...	17. 5	↓	↓	...	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19. 5	19.50	↓	↓
Chilston ...	... ,,	↓	...	...	17.11	↓	↓	...	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19.11	19.56	↓	↓
Harrietsham ...	... ,,	↓	...	...	17.17	↓	↓	17.33	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19.17	...	↓	↓
Leeds Castle ...	... ,,	↓	...	...	17.21	↓	↓	↓	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19.21	...	↓	↓
Bearsted ...	... ,,	↓	...	...	17.26	↓	↓	↓	↓	↓	↓	↓	...	↓	...	↓	↓	...	...	↓	19.26	...	↓	↓
Maidstone ...	... arr.	↓	...	...	17.30	↓	↓	↓	↓	↓	↓	↓	...	18.20	...	↓	↓	...	...	19.10	19.30	...	↓	↓
	dep.	↓	16.45	...	17.33	↓	↓	↓	↓	↓	↓	↓	18. 0	18.23	...	↓	↓	18.45	...	19.13	19.33	...	↓	↓
Preston Hall ...	... ,,	↓	16.49	...	↓	↓	↓	↓	↓	↓	↓	↓	18. 4	↓	...	↓	↓	18.49	...	↓	↓	...	↓	↓
Leybourne ...	... ,,	↓	16.55	...	↓	↓	↓	↓	↓	↓	↓	↓	18.10	↓	...	↓	↓	18.55	...	↓	↓	...	↓	↓
Addington ...	... ,,	↓	16.58	...	↓	↓	↓	↓	↓	↓	↓	↓	18.13	↓	...	↓	↓	18.58	19.10	↓	↓	...	↓	↓
Trottiscliffe ...	... ,,	↓	17. 0	17.33	↓	↓	↓	↓	↓	↓	↓	↓	18.15	↓	...	↓	↓	19. 0	19.12	↓	↓	...	↓	↓
Ridley	... ,,	↓	17. 6	↓	↓	↓	↓	↓	↓	↓	↓	↓	18.21	↓	...	↓	↓	19. 6	...	↓	↓	...	↓	↓
Fawkham Green	... ,,	↓	17.10	↓	↓	↓	↓	↓	↓	↓	↓	↓	18.25	↓	...	↓	↓	19.10	...	↓	↓	...	↓	↓
Farningham ...	... arr.	↓	17.15	↓	↓	↓	↓	↓	↓	↓	↓	↓	18.30	18.40	...	↓	↓	19.15	...	↓	↓	...	↓	↓
	dep.	↓	17.17	↓	↓	↓	↓	↓	↓	↓	↓	↓	18.32	18.42	...	↓	↓	19.17	...	↓	↓	...	↓	↓
London ...	... arr.	17.30	17.35	17.55	18. 0	17.40	18. 0	18. 5	18.10	18.15	18.25	18.45	18.50	19. 0	...	19.20	19.30	19.35	...	19.40	20. 0	...	20.10	20.15
Platform		M	OS	OS	OS	M	M	OS	OS	OS	M	M	OS	OS		M	M	OS		OS	OS		M	M

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

4. ENGLISH SECTION UP TRAINS—*continued.*

Train No.		37	26	RM	1	19	7	36	2	35	3	28	RM	8	22	4	37	23	36	34	28	5	9	6
Paris	... *dep.*	...	...	...	18.15	...	...	...	18.55	...	19.45	...	...	...	...	20.30	...	...	...	...	...	22. 0	...	0. 0
Boulogne ...	... ,,	...	...	...		...	20. 0	...		...		...	...	21.20	...		...	...	...	...	...		23.40	
Monks Horton...	... ,,	...	19.50	...		20. 0		...		20.40		...	...		21.40		...	22.15	...	23.30	...			
Brabourne ...	... ,,	...		...		...		...		20.44		...	...		21.45		...	22.19	...	...	...			
Willesborough ...	... ,,	...		...		...		...		20.49		...	...		21.50		...	22.24	...	...	...			
Ashford... ...	... *arr.*	...		...		20.10		...		20.53		...	...		21.55		...	22.28	...	23.40	...			
	dep.	...		...		20.13		...		20.55		...	21.30		21.58		...	22.30	...	23.43	...			
Hothfield ...	... ,,	...		...				...		21. 1		...	21.36				...	22.36	...		...			
Little Chart ...	... ,,	...		...				...		21. 5		...	21.40				...	22.40	...		...			
Chilston ...	... ,,	...		20. 8				...		21 11		...	21.46				...	22.46	...		...			
Harrietsham ...	... ,,	...		20.14				...		21.17		...	21.52				...	22.52	...		...			
Leeds Castle ...	... ,,	...		20.18				...		21.21		...	21.56				...	22.56	...		...			
Bearsted ...	... ,,	...		20.23				...		21.26		...	22. 1				...	23. 1	...		...			
Maidstone ...	... *arr.*	...		20.27		20.30		...		21.30		...	22. 5		22.15		...	23. 5	...	0. 0	...			
	dep.	19.45				20.33		20.45		21.33		21.45	...		22.18		22.30	23. 8	23.25	0. 3	0.15			
Preston Hall ...	... ,,	19.49		...				20.49				21.49	...				22.34		23.29		0.19			
Leybourne ...	... ,,	19.55		...				20.55				21.55	...				22.40		23.35		0.25			
Addington ...	... ,,	19.58	Stops at	...				20.58				21.58	...				22.43		23.38		0.28			
Trottiscliffe ...	... ,,	20. 0	20.38	...				21. 0				22. 0	...				22.45		23.40		0.30			
Ridley	... ,,	20. 6	Sidcup	...				21. 6				22. 6	...				22.51		23.46		...			
Fawkham Green	... ,,	20.10	...	...				21.10				22.10	...				22.55		23.50		...			
Farningham ...	... *arr.*	20.15	20.27	...				21.15				22.15	...				23. 0		23.55		...			
	dep.	20.17	20.30	...				21.17				22.17	...				23. 2		23.57		...			
London ...	... *arr.*	20.35	20.52	...	21. 0	21. 0	21.25	21.35	21.40	22. 0	22.30	22.35	...	22.45	22.45	23.15	23.20	23.35	0.15	0.30	...	0.45	1. 5	2.45
Platform		OS	OS		M	OS	M	OS	M	OS	M	OS		M	OS	M	OS	OS	OS	OS		M	M	M

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

R

5. FARNINGHAM, SIDCUP AND LONDON

Up Trains Train No.			92	102	100	101		99	93	92		18	91	102	101		100	91	92	93	94	95	96	97
Farningham ... ... dep.	...	...	5. 0	5.30	6. 0	6.20	...	6.40	...	7. 0	...	7.17	...	7.20	...	...	7.34	...	...	...	...	...	...	...
Swanley ... ... „	...	...	5. 5	5.35	6. 5	6.25	...	6.45	...	7. 5	...		...	7.25	...	...	7.39	...	...	...	...	...	...	...
Stonehill Green ... „	...	...	5. 7	5.37	6. 7	6.27	...	6.47	...	7. 7	...		...	7.27	...	...	7.41	...	...	...	...	...	...	7.58
North Cray ... ... „	...	...	5.10	5.40	6.10	6.30	...	6.50	...	7.10	...		...	7.30	...	...	7.44	...	...	...	...	...	...	8. 1
Sidcup ... ... „	...	...	**5.13**	**5.43**	**6.13**	**6.33**	...	**6.53**	**6.57**	**7.13**	...		**7.17**	**7.33**	**7.37**	...	**7.47**	...	...	...	...	...	**8. 1**	
Southwood ... ... „	...	...	5.15	5.45	6.15	6.35	...		6.59		...		7.19		7.39	...		...	...	...	...	8. 0		
Eltham and Mottingham „	...	...	5.18	5.48	6.18	6.38	...		7. 2		...		7.22		7.42	...		...	...	...	7.59			
Lee ... ... „	...	...	5.21	5.51	6.21	6.41	...		7. 5		...		7.25		7.45	...		...	...	7.59	...			
Lewisham ... ... „	...	...	5.24	5.54	6.24	6.44	...		7. 8		...		7.28		7.48	...		...	7.58	...	...			
Peckham ... ... „	...	...	5.28	5.58	6.28	6.48	...		7.12		...		7.32		7.52	...		7.58	...	...	...			
London ... ... arr.	...	...	**5.35**	**6. 5**	**6.35**	**6.55**	...	**7. 7**	**7.19**	**7.27**	...	**7.35**	**7.39**	**7.47**	**7.59**	...	**8. 1**	**8. 5**	**8. 7**	**8. 9**	**8.11**	**8.13**	**8.15**	**8.17**
Platform			12	9	10	11		12	9	10		OS	11	12	10		9	11	10	9	12	11	10	9

6. LONDON, SIDCUP AND FARNINGHAM

Down Trains Train No. ... ... Platform	95 12	36 OS	92 12	102 9	100 10	101 11	37 OS	99 12	93 9	92 10	RM		91 11	102 12	101 10	18 OS	100 9	91 11	92 10	93 9	94 12	95 11	96 10	97 9
London ... ... dep.	5.30	5.55	6. 0	6.30	6.50	7. 0	7.10	7.15	7.25	7.33	...	...	7.45	7.53	8. 4	8. 5	8. 6	8.11	8.13	8.15	8.17	8.19	8.21	8.23
Peckham ... ... arr.	5.37		6. 7	7.37	6.57	7. 7		7.22	7.32	7.40	...	...	7.53	8. 0	...		8.14						...	...
Lewisham ... ... „	5.41		6.11	6.41	7. 1	7.11		7.26	7.36	7.45	7.55	...	...	8. 4	8.14		...						...	...
Lee ... ... „	5.44		6.14	6.44	7. 4	7.14		7.29	7.40	...	7.58	...	...	8. 8	...		...						...	8.34
Eltham and Mottingham „	5.47		6.17	6.47	7. 7	7.17		7.32	...	...	8. 1	...	...	...	...		...						8.34	...
Southwood ... ... „	5.50		6.20	6.50	7.10	7.20		7.35	...	...	8. 4	...	...	...	...		...					8.33	...	...
Sidcup ... ... „	**5.52**		**6.22**	**6.52**	**7.12**	**7.23**		**7.37**	...	...	**8 6**	...	...	...	...		...				**8.32**	...	...	...
North Cray ... ... „	5.55		6.25	6.55	7.15	...		7.40	...	...	8. 9	...	...	...	...		...			8.32	...	...	...	...
Stonehill Green ... „	5.58		6.28	6.58	7.18	...		7.43	...	...	8.12	...	...	...	...		...			8.35	...	...	...	...
Swanley ... ... „	6. 0		6.30	7. 0	7.20	...		7.45	...	...	8.14	...	...	...	...		...		8.32	...	...	...	...	...
Farningham ... ... „	6. 5	6.13	6.35	7. 5	7.25	...	7.28	7.50	...	...	8.19	...	...	...	...	8.23	...	8.33	...	...	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	98	99	100	101	102	103	104	105	106	107	108	R M	99	98	97	96	95		94	93	92	91	108	
Farningham ... ... *dep.*	...	8. 0	...	...	...	...	...	...	...	...	8.20	8.25	...	...	...	...	...	...	...	...	...	8.40	...	...
Swanley ... ... „	8. 1		...	...	...	...	...	...	...	8.21			...	...	...	...	...	...	...	...	8.41		...	...
Stonehill Green ... „			...	...	...	...	...	...	8.18				...	...	...	...	...	...	...	8.38			...	...
North Cray ... ... „			...	...	...	...	...	...	8.21				...	...	...	...	...	...	...	8.41			...	...
Sidcup ... ... „			...	...	...	...	...	8.21					...	...	...	...	...	...	8.41				...	...
Southwood ... ... „			...	...	...	...	8.20						...	...	...	...	8.40	...					...	...
Eltham and Mottingham „			...	...	...	8.19						8.37	...	...	...	8.39		...					...	...
Lee ... ... „			...	...	8.19	...						...	...	...	8.39	...		...					...	...
Lewisham ... ... „			...	8.18	...	...						...	...	8.38	...	...		...					...	...
Peckham ... ... „			8.18	...	...	...						...	8.38	...	...	...		...					8.58	...
London ... ... *arr.*	8.19	8.21	8.25	8.27	8.29	8.31	8.33	8.35	8.37	8.39	8.41	...	8.45	8.47	8.49	8.51	8.53	...	8.55	8.57	8.59	9. 1	9. 5	...
Platform	12	11	9	12	11	10	9	12	11	10	9		11	10	9	12	11		10	9	12	11	9	

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No. ... ... Platform	98 12	99 11	100 9	101 12	102 11	103 10	104 9	105 12	106 11	107 10	108 9		99 11	98 10	97 9	96 12	95 11	R M	94 10	93 9	92 12	91 11	108 9	21 OS
London ... ... *dep.*	8.25	8.27	8.31	8.33	8.35	8.37	8.39	8.41	8.43	8.45	8.47	...	8.51	8.53	8.55	8.57	8.59	...	9. 1	9. 3	9. 5	9. 7	9.11	9.13
Peckham ... ... *arr.*	...	8.35						...	...	...	8.55	...						...	...	...	...	9.15		
Lewisham ... ... „	8.35	...						...	...	8.55	...	...						...	...	...	9.15	...		
Lee ... ... „	...	...						...	8.54	...	...	...						...	...	9.14	...	...		
Eltham and Mottingham „	...	...						8.54	...	...	...	...						9.13	9.14	...	...	...		
Southwood ... ... „	...	...					8.53	...	...	...	...	...					9.13	...	...	...	...	...		
Sidcup ... ... „	...	...				8.52	...	...	...	...	...	...				9.12	...	...	...	...	...	...		9.27
North Cray ... ... „	...	...			8.52	...	...	...	...	...	...	...			9.12	...	...	...	...	...	...	...		...
Stonehill Green ... „	...	...			8.55	...	...	...	...	...	...	...			9.15	...	...	9.22	...	...	...	...		...
Swanley ... ... „	...	...		8.52	...	...	...	...	...	...	...	...		9.12	...	...	...	9.25	...	...	...	...		...
Farningham ... ... „	...	...	8.53	...	...	...	...	...	...	...	...	...	9.13	...	...	...	...	9.30 (*a*)	...	...	...	...	9.33	9.36

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor. (*a*) Arrives Fawkham Green 9.36.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

UP TRAINS TRAIN No.	107	106	105	104		103	102		101	100	91	92	93	94	95	96	97	98	99	100	101	102	103	104
Farningham ... ... *dep.*	...	...	...	...	...	...	...	...	...	9. 0	...	...	...	...	...	...	...	...	9 20	...	...	...	...	...
Swanley ... ... ,,	...	...	...	...	...	...	...	...	9. 1		...	...	...	...	...	...	...	9.21		...	...	...	...	...
Stonehill Green ... ,,	...	...	...	...	...	...	8.58	...			...	...	...	...	...	...	9.18			...	...	...	...	...
North Cray ... ... ,,	...	...	...	...	...	...	9. 1	...			...	...	...	...	...	...	9.21			...	...	...	...	...
Sidcup ... ... ,,	...	...	...	...	...	9. 1		...			...	...	...	...	...	9.21				...	...	...	...	9 40
Southwood ... ... ,,	...	...	...	9. 0	...			...			...	...	...	...	9.20					...	...	...	...	
Eltham and Mottingham ,,	...	...	8.59		...			...			...	...	...	9.19						...	...	...	9.39	
Lee ... ... ,,	...	8.59	...		...			...			...	...	9.19	...						...	...	9.39	...	
Lewisham ... ... ,,	8.58	...	...		...			...			...	9.18	...	...						...	9.38	...	...	
Peckham ... ... ,,	...	...	...		...			...			9.18	...	...	...						9.38	...	...	...	
London ... ... *arr.*	9. 7	9. 9	9.11	9.13	...	9.15	9.17	...	9.19	9.21	9.25	9.27	9.29	9.31	9.33	9.35	9.37	9.39	9.41	9.45	9.47	9.49	9.51	9.53
PLATFORM	12	11	10	9		12	11		10	9	11	10	9	12	11	10	9	12	11	9	12	11	10	9

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

DOWN TRAINS TRAIN No. ... .. PLATFORM	107 12	106 11	105 10	104 9	37 OS	103 12	102 11	30 OS	101 10	100 9	91 11	92 10	93 9	94 12	95 11	96 10	97 9	98 12	99 11	100 9	101 12	102 11	103 10	104 9
London ... ... *dep.*	9.13	9.15	9.17	9.19	9.20	9.21	9.23	9.25	9.25	9.27	9.31	9.33	9.35	9.37	9.39	9.41	9.43	9.45	9.47	9.50	9.53	9.55	9.57	9.59
Peckham ... ... *arr.*						...	...		...	9.35						...	...	...	9.55					
Lewisham ... ... ,,						...	...		9.35	...						...	...	9.55	...					
Lee ... ... ,,						...	9.34		...	...						...	9.54	...	...					
Eltham and Mottingham ,,						9.34	...		...	...						9.54	...	...	...					
Southwood ... ... ,,				9.33		...	...		...	...					9.53	...	...	...	...					10.13
Sidcup ... ... ,,			9.32	...		...	...		...	...				9.52	...	...	...	...	...		10. 8		10.11	...
North Cray ... ... ,,		9.32	...	...		...	...		...	...			9.52	...	...	...	...	...	...		...		...	...
Stonehill Green ... ,,		9.35	...	...		...	...		...	...			9.55	...	...	...	...	...	...		...		...	...
Swanley ... ... ,,	9.32	...	...	...		...	...		...	...		9.52	...	...	...	...	...	...	...		...	10.14	...	...
Farningham ... ... ,,	...	...	...	...	9.40	...	...	9.43	...	...	9.53	...	...	...	...	...	...	...	...	10.12	...	...	10.20	...

O.S.—Outer Suburban Platforms, Nos. 5—8.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	105	106	107	108	99	98	97	96	95	94	93		92	91	101		100	106		103	92	97	30	101
Farningham ... ... *dep.*	...	...	...	9.40	...	...	...	...	...	...	...	...	...	10. 0	...	...	10.18	...	...	10.38	...	10.58	11.17	...
Swanley... ... ... „	...	...	9.41		...	...	...	...	...	...	...	...	10. 1		...	...	10.23	...	...	10.43	...	11. 3		...
Stonehill Green ... „	...	9.38			...	...	...	...	...	...	9.58	...			...	...	10.25	...	...	10.45	...	11. 5		...
North Cray ... ... „	...	9.41			...	...	...	...	...	...	10. 1	...			...	...	10.28	...	...	10.48	...	11. 8		...
Sidcup ... ... „	9.41				...	...	...	...	...	10. 1		...			10.18	...	10.31	10.38	...	10.51	10.58	11.11		11.18
Southwood ... ... „					...	...	...	...	10. 0			...			10.20	...		10.40	...		11. 0			11.20
Eltham and Mottingham „					...	...	...	9.59				...			10.23	...		10.43	...		11. 3			11.23
Lee ... ... „					...	...	9.59	...				...			10.26	...		10.46	...		11. 6			11.26
Lewisham ... ... „					...	9.58	...	...				...			10.29	...		10.49	...		11. 9			11.29
Peckham ... ... „					9.58	...	...	...				...			10.33	...		10.53	...		11.13			11.33
London... ... ... *arr.*	9.55	9.57	9.59	10. 1	10. 5	10. 7	10. 9	10 11	10.13	10.15	10.17	...	10.19	10.21	10.40	...	10.45	11. 0	...	11. 5	11.20	11.25	11.35	11.40
Platform	12	11	10	9	11	10	9	12	11	10	9		12	11	10		11	12		9	10	11	OS	12

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No. ... ... Platform	105 12	106 11	107 10	108 9	99 11	98 10	97 9	96 12	95 11	94 10	93 9	18 OS	92 12	91 11	101 10	19 OS	100 11	106 12	37 OS	103 9	92 10	97 11		101 12
London... ... ... *dep.*	10. 1	10. 3	10. 5	10. 7	10.11	10.13	10.15	10.17	10.19	10.21	10.23	10.25	10.27	10.45	10.50	11. 0	11. 5	11.10	11.25	11.25	11.30	11.45	...	11.50
Peckham ... ... *arr.*	...	...	...	10.15				10.24	10.27	...	...		10.34		10.57			11.17			11.37		...	11.57
Lewisham ... ... „	...	...	10.15	...				10.28	...	10.31	...		10.38		11. 1			11.21			11.41		...	12. 1
Lee ... ... „	...	10.13	...	...				10.31	...	...	10.34		10.41		11. 4			11.24			11.44		...	12. 4
Eltham and Mottingham „	10.14	10.16	...	...				10.34	...	...	...		10.44		11. 7			11.27			11.47		...	12. 7
Southwood ... ... „	...	10.19	...	...				10.37	...	...	...		10.47		11.10			11.30			11.50		...	12.10
Sidcup ... ... „	...	10.22	...	...			10.29	10.39	...	...	...		10.50	10.59	11.13		11.19	11.33		11.39	11.53	11.59	...	12.13
North Cray ... ... „	...	...	...	...			...	10.42	...	...	...		...	11. 2	...		11.22	...		11.42	...	12. 2	...	...
Stonehill Green ... „	...	...	...	...	10.28		...	10.45	...	...	...		...	11. 5	...		11.25	...		11.45	...	12. 5	...	...
Swanley... ... ... „	...	...	...	...	10.30	10.32	...	10.47	...	...	...		...	11. 7	...		11.27	...		11.47	...	12. 7	...	...
Farningham ... ... „	...	...	...	...	10.35	...	10.39	10.52	...	...	...	10.43	...	11.12	...	11.18	11.32	...	11.43	11.52	...	12.12	...	...

O.S.—Outer Suburban Platforms, Nos. 5—8.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains / Train No.		91	106		100	22	92	103	18	101	97	106		91	92	100	37	101	103	106		97	92	91
Farningham	dep.	11.18	...	...	11.38	11.52	...	11.58	12.17	...	12.18	...	...	12.38	...	12.58	13.17	...	13.18	...	...	13.38	...	13.58
Swanley...	,,	11.23	...	...	11.43	↓	...	12. 3	↓	...	12.23	...	...	12.43	...	13 3	↓	...	13.23	...	...	13.43	...	14. 3
Stonehill Green	,,	11.25	...	...	11.45	↓	...	12. 5	↓	...	12.25	...	...	12.45	...	13. 5	↓	...	13.25	...	...	13.45	...	14. 5
North Cray	,,	11.28	...	...	11.48	↓	...	12. 8	↓	...	12.28	...	...	12.48	...	13. 8	↓	...	13.28	...	...	13.48	...	14. 8
Sidcup ...	,,	11.31	11.38	...	11.51	↓	11.58	12.11	↓	12.18	12.31	12.38	...	12.51	12.58	13.11	↓	13.18	13.31	13.38	...	13.51	13.58	14.11
Southwood	,,	↓	11.40	...	↓	↓	12. 0	↓	↓	12.20	↓	12.40	...	↓	13. 0	↓	↓	13.20	↓	13.40	...	↓	14. 0	↓
Eltham and Mottingham	,,	↓	11.43	...	↓	↓	12. 3	↓	↓	12.23	↓	12.43	...	↓	13. 3	↓	↓	13.23	↓	13.43	...	↓	14. 3	↓
Lee ...	,,	↓	11.46	...	↓	↓	12. 6	↓	↓	12.26	↓	12.46	...	↓	13. 6	↓	↓	13.26	↓	13.46	...	↓	14. 6	↓
Lewisham	,,	↓	11.49	...	↓	↓	12. 9	↓	↓	12.29	↓	12.49	...	↓	13. 9	↓	↓	13.29	↓	13.49	...	↓	14. 9	↓
Peckham	,,	↓	11.53	...	↓	↓	12.13	↓	↓	12.33	↓	12.53	...	↓	13.13	↓	↓	13.33	↓	13.53	...	↓	14.13	↓
London ...	arr.	11.45	12. 0	...	12. 5	12.10	12.20	12.25	12.35	12.40	12.45	13. 0	...	13. 5	13.20	13.25	13.35	13.40	13.45	14. 0	...	14. 5	14.20	14.25
Platform		9	10		11	OS	12	9	OS	10	11	12		9	10	11	OS	12	9	10		11	12	9

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains / Train No. / Platform		91 9	106 10	30 OS	100 11		92 12	103 9		101 10	97 11	106 12	18 OS	91 9	92 10	100 11		101 12	103 9	106 10	37 OS	97 11	92 12	91 9
London...	dep.	12. 5	12.10	12.25	12.25	...	12.30	12.45	...	12.50	13. 5	13.10	13.25	13.25	13.30	13.45	...	13.50	14. 5	14.10	14.25	14.25	14.30	14.45
Peckham	arr.	↓	12.17	↓	↓	...	12.37	↓	...	12.57	↓	13.17	↓	↓	13.37	↓	...	13.57	↓	14.17	↓	↓	14.37	↓
Lewisham	,,	↓	12.21	↓	↓	...	12.41	↓	...	13. 1	↓	13.21	↓	↓	13.41	↓	...	14. 1	↓	14.21	↓	↓	14.41	↓
Lee ...	,,	↓	12.24	↓	↓	...	12.44	↓	...	13. 4	↓	13.24	↓	↓	13.44	↓	...	14. 4	↓	14.24	↓	↓	14.44	↓
Eltham and Mottingham	,,	↓	12.27	↓	↓	...	12.47	↓	...	13. 7	↓	13.27	↓	↓	13.47	↓	...	14. 7	↓	14.27	↓	↓	14.47	↓
Southwood	,,	↓	12.30	↓	↓	...	12.50	↓	...	13.10	↓	13.30	↓	↓	13.50	↓	...	14.10	↓	14.30	↓	↓	14.50	↓
Sidcup ...	,,	12.19	12.33	↓	12.39	...	12.53	12.59	...	13.13	13.19	13.33	↓	13.39	13.53	13.59	...	14.13	14.19	14.33	↓	14.39	14.53	14.59
North Cray	,,	12.22	...	↓	12.42	...	...	13. 2	...	...	13.22	...	↓	13.42	...	14. 2	...	...	14.22	...	↓	14.42	...	15. 2
Stonehill Green	,,	12.25	...	↓	12.45	...	...	13. 5	...	...	13.25	...	↓	13.45	...	14. 5	...	...	14.25	...	↓	14.45	...	15. 5
Swanley...	,,	12.27	...	↓	12.47	...	...	13. 7	...	...	13.27	...	↓	13.47	...	14. 7	...	...	14.27	...	↓	14.47	...	15. 7
Farningham	,,	12.32	...	12.43	12.52	...	...	13.12	...	...	13.32	...	13.43	13.52	...	14.12	...	...	14.32	...	14.43	14.52	...	15.12

O.S.—Outer Suburban Platforms, Nos. 5–8.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	30	101		100	106		103	92	97	18	101	91	106		100	21	92	R.M.	95	94	93	105	104
Farningham ... ... dep.	14.17	...	...	14.18	...	...	14.38	...	14.58	15.17	...	15.18	...	...	15.38	15.52	...	15.55	...	...	...	...	...
Swanley... ... ... „	↓	...	...	14.23	...	...	14.43	...	15. 3	↓	...	15.23	...	...	15.43	↓	...	16. 0	...	...	...	...	...
Stonehill Green ... „	↓	...	...	14.25	...	...	14.45	...	15. 5	↓	...	15.25	...	...	15.45	↓	...	16. 2	...	...	...	...	...
North Cray ... ... „	↓	...	...	14.28	...	...	14.48	...	15. 8	↓	...	15.28	...	...	15.48	↓	...	16. 5	...	...	...	...	...
Sidcup ... ... „	↓	14.18	...	14.31	14.38	...	14.51	14.58	15.11	↓	15.18	15.31	15.38	...	15.51	↓	15.58	16. 8	...	...	...	...	...
Southwood ... ... „	↓	14.20	...	↓	14.40	...	↓	15. 0	↓	↓	15.20	↓	15.40	...	↓	↓	16. 0	16.10	...	...	...	...	16.19
Eltham and Mottingham „	↓	14.23	...	↓	14.43	...	↓	15. 3	↓	↓	15.23	↓	15.43	...	↓	↓	16. 3	16.13	...	...	...	16.18	↓
Lee ... ... „	↓	14.26	...	↓	14.46	...	↓	15. 6	↓	↓	15.26	↓	15.46	...	↓	↓	16. 6	16.16	...	...	16.18	...	↓
Lewisham ... ... „	↓	14.29	...	↓	14.49	...	↓	15. 9	↓	↓	15.29	↓	15.49	...	↓	↓	16. 9	...	...	16.17	...	...	↓
Peckham ... ... „	↓	14.33	...	↓	14.53	...	↓	15.13	↓	↓	15.33	↓	15.53	...	↓	↓	16.13	...	16.17	...	...	...	↓
London... ... ... arr.	14.35	14.40	...	14.45	15. 0	...	15. 5	15.20	15.25	15.35	15.40	15.45	16. 0	...	16. 5	16.10	16.20	...	16.24	16.26	16.28	16.30	16.32
Platform	OS	10		11	12		9	10	11	OS	12	9	10		11	OS	12		11	10	9	12	11

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No. ... ... Platform		101 10	32 OS	100 11	106 12	30 OS	103 9	92 10	97 11		101 12	91 9	106 10	RM	100 11		92 12		95 11	94 10	93 9	105 12	104 11
London ... ... dep.	...	14.50	15. 0	15. 5	15.10	15.25	15.25	15.30	15.45	...	15.50	16. 5	16. 7		16.20		16.23	...	16.30	16.32	16.34	16.36	16.38
Peckham ... ... arr.	...	14.57	↓	↓	15.17	↓	↓	15.37	↓	...	15.57	↓	16.14	...	↓	...	...	...	↓	↓	↓	↓	↓
Lewisham ... ... „	...	15. 1	↓	↓	15.21	↓	↓	15.41	↓	...	16. 1	↓	16.18	...	↓	...	...	...	↓	↓	↓	↓	↓
Lee ... ... „	...	15. 4	↓	↓	15.24	↓	↓	15.44	↓	...	16. 4	↓	16.21	16.26	↓	...	16.34	...	↓	↓	↓	↓	↓
Eltham and Mottingham „	...	15. 7	↓	↓	15.27	↓	↓	15.47	↓	...	16. 7	↓	16.24	↓	↓	...	...	...	↓	↓	↓	↓	↓
Southwood ... ... „	...	15.10	↓	↓	15.30	↓	↓	15.50	↓	...	16.10	↓	16.27	↓	↓	...	...	...	↓	↓	↓	↓	16.52
Sidcup ... ... „	...	15.13	↓	15.19	15.33	↓	15.39	15.53	15.59	...	16.13	16.19	16.30	↓	16.35	...	...	...	↓	↓	↓	16.51	...
North Cray ... ... „	...	...	↓	15.22	...	↓	15.42	...	16. 2	...	...	16.22	...	↓	...	...	...	...	↓	↓	16.51	...	...
Stonehill Green ... „	...	...	↓	15.25	...	↓	15.45	...	16. 5	...	...	16.25	...	↓	...	...	...	...	↓	↓	16.54	...	...
Swanley ... ... „	...	...	↓	15.27	...	↓	15.47	...	16. 7	...	...	16.27	...	↓	...	...	...	...	↓	16.51	...	...	...
Farningham ... ... „	...	...	15.18	15.32	...	15.43	15.52	...	16.12	...	...	16.32	...	16.40	...	...	...	...	16.52	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains / Train No.	101	37	99	102	96	108	107	92	106	103	100	97	91	98	96	102	99	101	34		104	105	93
Farningham ... ... dep.	...	16.17	...	...	16.19	...	...	...	...	16.24	...	16.30	16.35	16.39	...	...	...	...	16.52	...	...	...	...
Swanley ... ... „	...	↓	...	16.20	↓	...	...	...	...	16.29	...	...	16.40	↓	...	...	...	...	↓	...	...	...	...
Stonehill Green ... „	...	↓	16.17	↓	↓	...	...	...	...	16.31	...	16.37	↓	↓	...	...	...	...	↓	...	...	...	16.57
North Cray ... ... „	...	↓	16.20	↓	↓	...	...	...	...	16.34	...	16.40	↓	↓	...	...	...	...	↓	...	...	...	17. 0
Sidcup ... ... „	16.20	↓	↓	↓	↓	...	...	...	16.33	16.37	16.40	↓	↓	↓	...	...	...	...	↓	...	...	17. 0	↓
Southwood ... ... „	↓	↓	↓	↓	↓	...	...	...	16.35	16.39	↓	↓	↓	↓	...	...	...	...	↓	...	16.59	↓	↓
Eltham and Mottingham „	↓	↓	↓	↓	↓	...	...	...	16.38	↓	↓	↓	↓	↓	...	...	...	16.58	↓	...	↓	↓	↓
Lee ... ... „	↓	↓	↓	↓	↓	...	...	16.38	...	↓	↓	↓	↓	↓	...	...	16.58	...	↓	...	↓	↓	↓
Lewisham ... ... „	↓	↓	↓	↓	↓	...	16.37	...	...	↓	↓	↓	↓	↓	...	16.57	...	...	↓	...	↓	↓	↓
Peckham ... ... „	↓	↓	↓	↓	↓	16.37	...	...	...	↓	↓	↓	↓	↓	16.57	...	...	...	↓	...	↓	↓	↓
London ... ... arr.	16.34	16.35	16.36	16.38	16.40	16.44	16.46	16.48	16.50	16.52	16.54	16.56	16.58	17. 0	17. 4	17. 6	17. 8	17.10	17.10	...	17.12	17.14	17.16
Platform	10	OS	9	12	11	9	12	11	10	9	12	11	10	9	11	10	9	12	OS		11	10	9

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains / Train No.	101		99	102	96	108	107	92	106	103	100	97	91	98	96	102	99	101		R M	104	105	93
Platform	10		9	12	11	9	12	11	10	9	12	11	10	9	11	10	9	12			11	10	9
London ... ... dep.	16.40	...	16.42	16.44	16.46	16.50	16.52	16.54	16.56	16.58	17. 0	17. 2	17. 4	17. 6	17.10	17.12	17.14	17.16	...	...	17.18	17.20	17.22
Peckham ... ... arr	...	...	...	...	16.54	↓	↓	↓	↓	↓	...	...	...	17.14	↓	↓	↓	↓	...	...	↓	...	...
Lewisham ... ... „	...	...	...	16.54	...	↓	↓	↓	↓	↓	...	...	17.14	...	↓	↓	↓	↓	...	...	↓	...	...
Lee ... ... „	...	...	16.53	...	...	↓	↓	↓	↓	↓	...	17.13	...	...	↓	↓	↓	↓	...	...	↓	...	17.33
Eltham and Mottingham „	16.53	...	...	...	...	↓	↓	↓	↓	↓	17.13	...	...	...	↓	↓	↓	↓	...	...	↓	17.33	...
Southwood ... ... „	...	...	...	...	...	↓	↓	↓	↓	17.12	...	...	...	...	↓	↓	↓	↓	...	...	17.32	...	...
Sidcup ... ... „	...	...	...	...	...	↓	↓	↓	17.11	...	...	...	...	...	↓	↓	↓	17.31	...	17.33	...	...	...
North Cray ... ... „	...	...	...	...	...	↓	↓	17.11	...	...	...	...	...	...	↓	↓	17.31	...	...	17.36	...	...	...
Stonehill Green ... „	...	...	...	...	...	↓	↓	17.14	...	...	...	...	...	...	↓	↓	17.34	...	...	17.39	...	...	...
Swanley ... ... „	...	...	...	...	...	↓	17.11	...	...	...	...	...	...	...	↓	17.31	...	...	...	17.41	...	...	...
Farningham ... ... „	...	...	...	...	...	17.12	...	...	...	...	...	...	...	...	17.32	...	...	...	...	17.46	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains / Train No.		94	95	R M	98	91	97	100	103	106	30	92	107	108	95	94	93	105	104	101	99	102	96	108
Farningham	dep.	...	16.59	17. 1	...	...	...	...	...	...	17.17	...	...	17.19	...	...	...	...	...	...	...	...	17.39	...
Swanley	"	17. 0		17. 6	...	...	...	...	...	...		...	17.20		...	...	...	...	...	...	...	17.40		...
Stonehill Green	"			17. 8	...	...	...	...	...	...		17.17			...	...	...	...	...	...	17.37			...
North Cray	"			17.11	...	...	...	...	...	...		17.20			...	...	...	...	...	...	17.40			...
Sidcup	"			17.14	...	...	...	...	...	17.20					...	...	...	...	...	17.40				...
Southwood	"			...	...	...	...	...	17.19						...	...	...	...	17.39					...
Eltham and Mottingham	"			...	...	...	...	17.18							...	...	...	17.38						...
Lee	"			...	...	...	17.18	...							...	...	17.38	...						...
Lewisham	"			...	...	17.17	...	...							...	17.37	...	...						...
Peckham	"			...	17.17	...	...	...							17.37	...	...	...						17.57
London	arr.	17.18	17.20	...	17.24	17.26	17.28	17.30	17.32	17.34	17.35	17.36	17.38	17.40	17.44	17.46	17.48	17.50	17.52	17.54	17.56	17.58	18. 0	18. 4
Platform		12	11		9	12	11	10	9	12	OS	11	10	9	11	10	9	12	11	10	9	12	11	9

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains / Train No.		94	95		98	91	97	100	103	106		92	107	108	95	94	93	105	104	101	99	102	96	108
Platform		12	11		9	12	11	10	9	12		11	10	9	11	10	9	12	11	10	9	12	11	9
London	dep.	17.24	17.26	...	17.30	17.32	17.34	17.36	17.38	17.40	...	17.42	17.44	17.46	17.50	17.52	17.54	17.56	17.58	18. 0	18. 2	18. 4	18. 6	18.10
Peckham	arr.	...	17.34	...						...	...	...	...	17.54	...					...	...	...	18.14	
Lewisham	"	17.34	...	...						...	...	...	17.54	...	...					...	...	18.14	...	
Lee	"	...	...	...						...	...	17.53	...	...	...					...	18.13	...	...	
Eltham and Mottingham	"	...	...	...						17.53	...	...	...	...	...					18.13	...	...	...	
Southwood	"	...	...	...					17.52	...	...	...	...	...	...				18.12	...	...	...	...	
Sidcup	"	...	...	...				17.51	...	...	...	...	...	...	...			18.11	...	...	...	...	...	
North Cray	"	...	...	...			17.51	...	...	...	...	...	...	...	...		18.11	...	...	...	...	...	...	
Stonehill Green	"	...	...	...			17.54	...	...	...	...	...	...	...	...		18.14	...	...	...	...	...	...	
Swanley	"	...	...	...		17.51	...	...	...	...	...	...	...	...	...	18.11	...	...	...	...	...	...	...	
Farningham	"	...	...	...	17.52	...	...	...	...	...	...	...	...	...	18.12	...	...	...	...	...	...	...	...	18.32

O.S.—Outer Suburban Platforms, Nos. 5–8.

R. M.—Rail Motor.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	107	92	106	103	100	97	91	98	96	102	99	101	104	105	93	94		95	98	91	97	100	36
Farningham ... ... dep.	...	...	...	...	...	...	...	17.59	...	...	...	...	...	...	...	...	...	18.19	...	...	...	...	18.32
Swanley ... ... ,,	...	...	...	...	...	...	18. 0	↓	...	...	...	...	...	...	...	18.20	...	↓	...	...	...	...	↓
Stonehill Green ... ,,	...	...	...	...	...	17.57	↓	↓	...	...	...	...	...	...	18.17	↓	...	↓	...	...	...	...	↓
North Cray ... ... ,,	...	...	...	...	...	18. 0	↓	↓	...	...	...	...	...	...	18.20	↓	...	↓	...	...	...	...	↓
Sidcup ... ... ,,	...	...	...	...	18. 0	↓	↓	↓	...	...	...	...	...	18.20	↓	↓	...	↓	...	...	...	...	↓
Southwood ... ... ,,	...	...	...	17.59	↓	↓	↓	↓	...	...	...	...	18.19	↓	↓	↓	...	↓	...	...	...	...	↓
Eltham and Mottingham ,,	...	...	17.58	↓	↓	↓	↓	↓	...	...	...	18.18	↓	↓	↓	↓	...	↓	...	...	...	18.38	↓
Lee ... ... ,,	...	17.58	...	↓	↓	↓	↓	↓	...	...	18.18	...	↓	↓	↓	↓	...	↓	...	...	18.38	...	↓
Lewisham ... ... ,,	17.57	...	...	↓	↓	↓	↓	↓	...	18.17	...	...	↓	↓	↓	↓	...	↓	...	18.37	...	...	↓
Peckham ... ... ,,	...	...	...	↓	↓	↓	↓	↓	18.17	...	...	...	↓	↓	↓	↓	...	↓	18.37	...	...	...	↓
London... ... ... arr.	18. 6	18. 8	18.10	18.12	18.14	18.16	18.18	18.20	18.24	18.26	18.28	18.30	18.32	18.34	18.36	18.38	...	18.40	18.44	18.46	18.48	18.50	18.50
Platform	12	11	10	9	12	11	10	9	11	10	9	12	11	10	9	12		11	9	12	11	10	OS

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No. ... ... / Platform	107 12	92 11	106 10	103 9	100 12	97 11	91 10	98 9	96 11	102 10	99 9	101 12	104 11	105 10	93 9	94 12	RM	95 11	98 9	91 12	97 11	100 10	
London... ... ... dep.	18.12	18.14	18.16	18.18	18.20	18.22	18.24	18.26	18.30	18.32	18.34	18.36	18.38	18.40	18.42	18.44		18.46	18.50	18.52	18.54	18.56	...
Peckham ... ... arr.	↓	↓	↓	↓	...	...	...	18.34	↓	↓	↓	↓	↓	...	...	...	...	18.54	↓	↓	↓	↓	...
Lewisham ... ... ,,	↓	↓	↓	↓	...	...	18.34	...	↓	↓	↓	↓	↓	...	...	18.54	...	...	↓	↓	↓	↓	...
Lee ... ... ,,	↓	↓	↓	↓	...	18.33	...	...	↓	↓	↓	↓	↓	...	18.53	...	...	...	↓	↓	↓	↓	...
Eltham and Mottingham ,,	↓	↓	↓	↓	18.33	...	...	...	↓	↓	↓	↓	↓	18.53	...	...	...	...	↓	↓	↓	↓	...
Southwood ... ... ,,	↓	↓	↓	18.32	...	...	...	...	↓	↓	↓	↓	18.52	...	...	...	...	...	↓	↓	↓	↓	...
Sidcup ... ... ,,	↓	↓	18.31	...	...	...	...	...	↓	↓	↓	18.51	...	...	...	...	18.59	...	↓	↓	↓	19.11	...
North Cray ... ... ,,	↓	18.31	...	...	...	...	...	...	↓	↓	18.51	...	...	...	...	...	...	...	↓	↓	19.11	...	...
Stonehill Green ... ,,	↓	18.34	...	...	...	...	...	...	↓	↓	18.54	...	...	...	...	...	...	...	↓	↓	19.14	...	...
Swanley ... ... ,,	18.31	...	...	...	...	...	...	...	↓	18.51	...	...	...	...	...	...	...	...	↓	19.11	...	...	...
Farningham ... ... ,,	...	...	...	...	...	...	...	...	18.52	...	...	...	...	...	...	...	19. 9	...	19.12	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	103	106	92	107	108	22	RM	95	94	93	105	104	101	99	102		96	108	107	92	106	103	100
Farningham ... ... *dep.*	...	...	...	...	18.39	18.42	18.43	...	...	...	...	...	...	...	...	...	18.59	...	...	...	...	...	...
Swanley ... ... ,,	...	...	...	18.40	↓	↓	18.48	...	...	...	...	...	...	...	19. 0	...	↓	...	...	...	...	...	...
Stonehill Green ... ,,	...	...	18.37	↓	↓	↓	...	...	...	...	...	...	...	18.57	↓	...	↓	...	...	...	...	...	...
North Cray ... ... ,,	...	...	18.40	↓	↓	↓	18.52	...	...	...	...	...	...	19. 0	↓	...	↓	...	...	...	...	...	...
Sidcup ... ... ,,	...	18.40	↓	↓	↓	↓	18.55	...	...	...	...	...	19. 0	↓	↓	...	↓	...	...	...	...	...	19.20
Southwood ... ... ,,	18.39	↓	↓	↓	↓	↓	...	...	...	...	...	18.59	↓	↓	↓	...	↓	...	...	...	...	19.19	↓
Eltham and Mottingham ,,	↓	↓	↓	↓	↓	↓	...	...	...	...	18.58	↓	↓	↓	↓	...	↓	...	...	...	19.18	↓	↓
Lee ... ... ,,	↓	↓	↓	↓	↓	↓	...	...	...	18.58	...	↓	↓	↓	↓	...	↓	...	...	19.18	...	↓	↓
Lewisham ... ... ,,	↓	↓	↓	↓	↓	↓	...	...	18.57	...	...	↓	↓	↓	↓	...	↓	...	19.17	...	...	↓	↓
Peckham ... ... ,,	↓	↓	↓	↓	↓	↓	...	18.57	...	...	...	↓	↓	↓	↓	...	↓	19.17	...	...	...	↓	↓
London ... ... *arr.*	18 52	18.54	18.56	18.58	19. 0	19. 0	...	19. 4	19. 6	19. 8	19.10	19.12	19.14	19.16	19.18	...	19.20	19.24	19.26	19.28	19.30	19.32	19.34
Platform	9	12	11	10	9	OS		11	10	9	12	11	10	9	12		11	9	12	11	10	9	12

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No. ... ... Platform	103 9	106 12	92 11	107 10	108 9			95 11	94 10	93 9	105 12	104 11	101 10	99 9	102 12	36 OS	96 11	108 9	107 12	92 11	106 10	103 9	100 12
London ... ... *dep.*	18.58	19. 0	19. 2	19. 4	19. 6	...	...	19.10	19.12	19.14	19.16	19.18	19.20	19.22	19.24	19.25	19.26	19.30	19.32	19.34	19.36	19.38	19.40
Peckham ... ... *arr.*	↓	...	...	...	19.14	...	...	↓	↓	↓	↓	↓	...	...	...	↓	19.34	↓	↓	↓	↓	↓	...
Lewisham ... ... ,,	↓	...	...	19.14	...	...	...	↓	↓	↓	↓	↓	...	...	19.34	↓	...	↓	↓	↓	↓	↓	...
Lee ... ... ,,	↓	...	19.13	...	...	...	...	↓	↓	↓	↓	↓	...	19.33	...	↓	...	↓	↓	↓	↓	↓	...
Eltham and Mottingham ,,	↓	19.13	...	...	...	...	...	↓	↓	↓	↓	↓	19.33	...	...	↓	...	↓	↓	↓	↓	↓	19.53
Southwood ... ... ,,	19.12	...	...	...	...	...	...	↓	↓	↓	↓	19.31	...	...	...	↓	...	↓	↓	↓	↓	19.52	...
Sidcup ... ... ,,	...	...	...	...	...	...	...	↓	↓	↓	19.31	19.34	...	...	...	↓	...	↓	↓	↓	19.51	...	...
North Cray ... ... ,,	...	...	...	...	...	...	...	↓	↓	19.31	...	...	...	...	...	↓	...	↓	↓	19.51	...	...	...
Stonehill Green ... ,,	...	...	...	...	...	...	...	↓	↓	19.34	...	...	...	...	...	↓	...	↓	↓	19.54	...	...	...
Swanley ... ... ,,	...	...	...	...	...	...	...	↓	19.31	...	...	...	...	...	...	↓	...	↓	19.50	19.56	...	...	...
Farningham ... ... ,,	...	...	...	...	...	...	...	19.32	...	...	...	...	...	...	...	19.43	...	19.52	19.55	20. 1	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains Train No.	28	97	91	98	R M		105	104	R M		95	106	108	37	98		92	26	104		105	106	95
Farningham ... ... dep.	19.17	...	...	19.19	19.21	...	...	...	...	...	19.38	...	19.58	20.17	...	...	20.18	20.30	...	...	20.35	...	20.58
Swanley ... ... ,,		...	19.20		19.26	...	...	...	...	...	19.43	...	20. 3		...	...	20.23	...	...	...	20.40	...	21. 3
Stonehill Green ... ,,		19.17			19.28	...	...	...	...	...	19.45	...	20. 5		...	...	20.25	...	...	...	20.42	...	21. 5
North Cray ... ... ,,		19.20			19.31	...	...	...	...	...	19.48	...	20. 8		...	...	20.28	...	...	...	20.45	...	21. 8
Sidcup ... ... ,,					19.34	...	19.35	19.38	19.44	...	19.51	19.58	20.11		20.18	...	20.31	20.38	20 40	...	20.48	20.58	21.11
Southwood ... ... ,,					...	...		19.40	...	...		20. 0			20.20	...			...	...	20.50	21. 0	
Eltham and Nottingham ,,					...	...		19.43	...	...		20. 3			20.23	...			...	...	20.53	21. 3	
Lee ... ... ,,					...	...		19.46	...	...		20. 6			20.26	...			20.46	...	...	21. 6	
Lewisham ... ... ,,					...	...		19.49	19.52	...		20. 9			20.29	...			20.49	...	...	21. 9	
Peckham ... ... ,,					...	...		19.53	...	...		20.13			20.33	...			20.53	...	...	21.13	
London ... ... arr.	19.35	19.36	19.38	19.40	...	...	19.49	20. 0	...	...	20. 5	20.20	20.25	20.35	20.40	...	20.45	20.52	21. 0	...	21. 5	21.20	21.25
Platform	OS	11	10	9			10	11			12	9	10	OS	11		12	OS	9		10	11	12

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains Train No.		97	91	98		22	105	104		28	95	106	108		98	34	92		104	37	105	106	95
Platform		11	10	9		OS	10	11		OS	12	9	10		11	OS	12		9	OS	10	11	12
London ... ... dep.	...	19.42	19.44	19.46	...	20. 0	20. 0	20.10	...	20.25	20.25	20.30	20.45	...	20.50	21. 0	21. 5	...	21.10	21.25	21.25	21.30	21 45
Peckham ... ... arr.	...	...	...	19.53	...		...	20.17	...			20.37		...	20.57			...	21.17			21.37	
Lewisham ... ... ,,	...	...	19.54	...	...		...	20.21	...			20.41		...	21. 1			...	21.21			21 41	
Lee ... ... ,,	...	19.52	...	...	...		...	20.24	...			20.44		...	21. 4			...	21.24			21.44	
Eltham and Mottingham ,,	...	19.55	...	...	...		20.12	20.27	...			20.47		...	21. 7			...	21.27			21.47	
Southwood ... ... ,,	...	19.58	...	...	...		...	20.30	...			20.50		...	21.10			...	21.30			21.50	
Sidcup ... ... ,,	...	20. 1	...	...	...		20.16	20.33	...		20.39	20.53	20.59	...	21.13		21.19	...	21.33		21.39	21.53	21.59
North Cray ... ... ,,	...	...	...	...	...		20.19	...	...		20.42	...	21. 2	...	...		21.22	...	...		21.42	...	22. 2
Stonehill Green ... ,,	...	...	...	...	...		20.22	...	...		20.45	...	21. 5	...	...		21.25	...	...		21.45	...	22. 5
Swanley ... ... ,,	...	20. 8	...	...	...		20.24	...	...		20.47	...	21. 7	...	...		21.27	...	...		21.47	...	22. 7
Farningham ... ... ,,	...	20.13	...	...	...	20.18	20.29	...	...	20.43	20.52	...	21.12	...	...	21.18	21.32	...	...	21.43	21.52	...	22.12

O.S.—Outer Suburban Platforms, Nos. 5–8. **R. M.**—Rail Motor.

5. FARNINGHAM, SIDCUP AND LONDON—*continued.*

Up Trains — Train No.	36	98	108	104		92	106	105	28	98	95		104	108	106	37	92		98	105	104	36	95
Farningham ... dep.	21.17	...	21.18	...	...	21.38	...	21.58	22.17	...	22.18	...	...	22.38	...	23. 2	23. 8	...	...	23.35	...	23.57	0. 5
Swanley ... ,,	↓	...	21.23	...	...	21.43	...	22. 3	↓	...	22.23	...	...	22.43	...	↓	23.13	...	...	23.40	...	↓	0.10
Stonehill Green ... ,,	↓	...	21.25	...	...	21.45	...	22. 5	↓	...	22.25	...	...	22.45	...	↓	23.15	...	...	23.42	...	↓	0.12
North Cray ... ,,	↓	...	21.28	...	...	21.48	...	22. 8	↓	...	22.28	...	...	22.48	...	↓	23.18	...	...	23.45	...	↓	0.15
Sidcup ... ,,	↓	21.18	21.31	21.38	...	21.51	21.58	22.11	↓	22.18	22.31	...	22.38	22.51	22.58	↓	23.21	...	23.23	23.48	23.50	↓	0.18
Southwood ... ,,	↓	21.20	↓	21.40	...	↓	22. 0	↓	↓	22.20	↓	...	22.40	↓	23. 0	↓	↓	...	23.25	↓	23.52	↓	↓
Eltham and Mottingham ,,	↓	21.23	↓	21.43	...	↓	22. 3	↓	↓	22.23	↓	...	22.43	↓	23. 3	↓	↓	...	23.28	↓	23.55	↓	↓
Lee ... ,,	↓	21.26	↓	21.46	...	↓	22. 6	↓	↓	22.26	↓	...	22.46	↓	23. 6	↓	↓	...	23.31	↓	23.58	↓	↓
Lewisham ... ,,	↓	21.29	↓	21.49	...	↓	22. 9	↓	↓	22.29	↓	...	22.49	↓	23. 9	↓	↓	...	23.34	↓	0. 1	↓	↓
Peckham ... ,,	↓	21.33	↓	21.53	...	↓	22.13	↓	↓	22.33	↓	...	22.53	↓	23.13	↓	↓	...	23.38	↓	0. 5	↓	↓
London ... arr.	21.35	21.40	21.45	22. 0	...	22. 5	22.20	22.25	22.35	22.40	22.45	...	23. 0	23. 5	23.20	23.20	23.35	...	23.45	0. 2	0.12	0.15	0.40
Platform ...	OS	9	10	11		12	9	10	OS	11	12		9	10	11	OS	12		9	10	11	OS	12

6. LONDON, SIDCUP AND FARNINGHAM—*continued.*

Down Trains — Train No. / Platform		98 / 9	108 / 10	104 / 11	36 / OS	92 / 12	106 / 9	105 / 10		98 / 11	95 / 12	28 / OS	104 / 9	108 / 10	106 / 11		92 / 12	23 / OS	98 / 9	105 / 10	104 / 11		
London ... dep.	...	21.50	22. 5	22.10	22.25	22.25	22.30	22.45	...	22.50	23. 5	23.10	23.10	23.25	23.30	...	23.45	23.50	23.50	0 10	0.20	...	...
Peckham ... arr.	...	21.57	↓	22.17	↓	↓	22.37	↓	...	22.57	↓	↓	23.17	↓	23.37	...	↓	↓	23.57	↓	0.27	...	...
Lewisham ... ,,	...	22. 1	↓	22.21	↓	↓	22.41	↓	...	23. 1	↓	↓	23.21	↓	23.41	...	↓	↓	0. 1	↓	0.31	...	...
Lee ... ,,	...	22. 4	↓	22.24	↓	↓	22.44	↓	...	23. 4	↓	↓	23.24	↓	23.44	...	↓	↓	0. 4	↓	0.34	...	...
Eltham and Mottingham ,,	...	22. 7	↓	22.27	↓	↓	22.47	↓	...	23. 7	↓	↓	23.27	↓	23.47	...	↓	↓	0. 7	↓	0.37	...	...
Southwood ... ,,	...	22.10	↓	22.30	↓	↓	22.50	↓	...	23.10	↓	↓	23.30	↓	23.50	...	↓	↓	0.10	↓	0.40	...	...
Sidcup ... ,,	...	22.13	22.19	22.23	↓	22.39	22.53	22.59	...	23.13	23.19	↓	23.33	23.39	23.53	...	23.59	↓	0.13	0.24	0.43	...	...
North Cray ... ,,	...	...	22.22	...	↓	22.42	...	23. 2	...	...	23.22	↓	...	23.42	...	...	0. 2	↓	...	0.27	...	...	...
Stonehill Green ... ,,	...	...	22.25	...	↓	22.45	...	23. 5	...	...	23.25	↓	...	23.45	...	...	0. 5	↓	...	0.30	...	...	...
Swanley ... ,,	...	...	22.27	...	↓	22.47	...	23. 7	...	...	23.27	↓	...	23.47	...	...	0. 7	↓	...	0.32	...	...	...
Farningham ... ,,	...	...	22.32	...	22.43	22.52	...	23.12	...	...	23.32	23.28	...	23.52	...	...	0.12	0. 8	...	0.37	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

R.M.—Rail Motor.

7. FRENCH SECTION UP TRAINS

Train No.		53	50	1	61	38	57	54	51	39	61	58	55	62	47	68	40	70	7	60	59	53	52	41	71	2
Londres	dép.	...	...	5.15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6.35	...	...	...	...	...	...	7.10
Ashford	,,	...	...		...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	
Wissant-Marquise	,,	...	...		...	5. 5	...	...	...	6.20	...	...	...	...	6.35	7. 0	7. 5	7.35		...	...	...	...	7.45	8. 5	
Ambleteuse	,,	...	...		...	5.13	...	...	...	6.28	...	...	...	...	6.43	7. 6	7.13	7.41		...	...	...	...	7.53	8.11	
Wimereux	,,	...	...		...	5.19	...	...	...	6.34	...	...	...	...	6.49	7.11	7.19	7.46		...	...	...	...	7.59	8.16	
Boulogne	arr.	...	...	6.40	...	5.25	...	...	...	6.40	...	...	...	...	6.55	7.17	7.25	7.52	8. 0	...	...	...	...	8. 5	8.22	
	dép.	...	...	slip	...	5.30	...	...	...	6.45	...	...	...	...	7. 0	7.20	7.30	7.55	...	...	...	...	...	8.10	8.25	
Pont-de-Briques	,,	...	...		...	5.36	...	...	...	...	...	...	...	...	7. 6	...		8. 1	...	...	...	...	...		8.31	
Nesles	,,	...	...		...	5.44	...	...	...	...	...	...	...	...	7.14	...		8. 9	...	...	...	...	...		8.39	
Frencq	,,	...	...		...	5.54	...	...	...	6.59	...	...	...	...	7.24	...		...	...	...	...	...	...		8.49	
Montreuil-sur-Mer	,,	...	...		...	6. 5	...	...	...	7. 9	...	...	...	...	7.35	7.41		...	...	...	...	...	...		9. 0	
Argoules	,,	...	...		...	6.18	...	...	...	...	...	...	...	...	7.48	...		...	...	...	...	...	...		...	
Crecy	,,	...	...		...	6.28	...	...	...	...	...	...	...	...	7.58	...		...	...	...	...	...	...		...	
St-Riquier	,,	...	...		...	6.41	...	...	...	7.29	...	...	...	...	8.11	...		...	...	...	...	...	...		...	
Domart	,,	...	...		...	6.51	...	...	...	...	...	...	...	...	8.21	...		...	...	...	...	...	...		...	
Vignacourt	,,	...	5.10		...	6.59	...	...	...	...	...	...	...	...	8.29	...		...	...	...	...	...	...		...	
Amiens	arr.	...	5.26		...	7.15	...	...	...	7.50	...	...	...	...	8.45	...		...	...	...	...	...	...	8.55	...	
	dép.	...	5.27		...	7.18	...	...	7.21	7.54	...	...	...	7.58	...	...		...	...	...	...	...	8.28	8.59	...	
Sains	,,	...	5.35		...	...	...	...	7.29		...	...	...	8. 6	...	...		...	...	...	...	...	8.36		...	
Ailly-sur-Noye	,,	...	5.42		...	...	...	...	7.36		...	...	...	8.13	...	...		...	...	...	...	...	8.43		...	
La Faloise	,,	...	5.50		...	...	...	...	7.44		...	...	...	8.21	...	...		...	...	...	...	...	8.51		...	
Breteuil	,,	5. 0	6. 0		...	7 35	...	...	7.53		...	...	...	8.30	...	...		...	...	...	...	...	9. 0		...	
Montreuil-sur-Brêche	arr.	5.13	6.13		...	7.46	...	...	8. 6		...	...	...	8.43	...	...		...	...	...	...	...	9.13		...	
	dép.	5.15	6.15		...	7.47	...	7.51	8.10		...	...	8.26	8.45	...	...		...	...	...	...	8.56	9.15		...	
Fay-St-Quentin	,,	5.24	6.24		...	Main	...	8. 0			...	...	8.35		...	...		...	...	...	...	9. 5			...	
Bresles	,,	5.28	6.28		...		...	8. 4			...	...	8.39		...	...		...	...	...	...	9. 9			...	
Hermes	,,	5.36	6.36		...		7.51	8.12			...	8.26	8.47		...	...		...	...	...	8.56	9.17			...	
Cauvigny	,,	5.44	6.44		...		7.59				...	8.34			...	...		...	...	...	9. 4				...	
Dieudonne	,,	5.53	6.53		...		8. 8				...	8.43			...	...		...	...	...	9.13				...	
Chambly-Fresnoy	,,	6. 0	7. 0		...		8.14				...	8.49			...	...		...	...	9. 8	9.19				...	
Beaumont-Persan	arr.	6 6	7. 6		...	8.10	...				...	...			...	...		...	...	9.14	...				...	
	dép.	6.10	7.10		7.40	8.12	...				8.40	...			...	...		...	...	9.15	...				...	
Paris	arr.	6.30	7.30	8. 0	8. 0	8.30	8.35	8.40	8 45	8.40	9. 0	9.10	9.15	9.20	...	...	8.50	...	...	9.35	9.40	9.45	9.50	9.45	...	9.55
Platform		OS	OS	M	OS	OS	OS	OS	OS	M	OS	OS	OS	OS			M			OS	OS	OS	OS	M		M

M—Main Line Platforms, Nos 1–4 **O.S.**—Outer Suburban Platforms, Nos. 5–8.

7. FRENCH SECTION UP TRAINS—*continued.*

Train No.		61	54	56	57	3	62	68	42	63	8	4	64	R M	50	43	70	5	51	69	9	7	49	71	6	44	68
Londres	dép.	...	...	...	...	7.45	...	...	...	...	8.10	8.30	...	...	...	...	...	9.15	...	...	9.25	...	...	...	10. 0	...	...
Ashford	,,	...	...	...	...		...	...	...	...			...	...	...	...	...		...	...		10. 5	...	...		...	...
Wissant-Marquise ...	,,	...	...	...	...		...	9. 0	9. 5	...			...	...	...	9.25	9.35		...	10. 0		...	10.40	10.55		11. 5	11.25
Ambleteuse	,,	...	...	...	...		...	9. 6	9.13	...			...	...	...	9.33	9.41		...	10. 6		...	10.48	11. 1		11.13	11.31
Wimereux	,,	...	...	...	...		...	9.11	9.19	...			...	...	...	9.39	9.46		...	10.11		...	10.54	11. 6		11.19	11.36
Boulogne	arr.	...	...	...	...		...	9.17	9.25	...	9.35		...	...	...	9.45	9.52		...	10.17	10.50	11. 0	11. 0	11 12		11.25	11.42
	dép.	...	...	...	...		...	9.20	9.30	...	...		...	...	...	9.50	9.55		...	10.20	...	...	11. 5	11.15		11.30	11.45
Pont-de-Briques ...	,,	...	...	...	...		...	9.26		...	...		...	...	...	...	10. 1		...	10.26	...	...	11.11	11.21			11.51
Nesles	,,	...	...	...	...		...	9.34		...	...		...	...	...	...	10. 9		...	10.34	...	...	11.19	11.29			11.59
Frencq	,,	...	...	...	...		...	...		...	...		...	...	...	10. 5	10.19		...	...	...	...	11.29	11.39			12. 9
Montreuil-sur-Mer ...	,,	...	...	...	...		...	...		...	...		...	...	...	10.15	10.30		...	...	...	...	11.40	...			12.20
Argoules	,,	...	...	...	...		...	...		...	...		...	...	...	...	...		...	...	...	...	11.53	...			...
Crecy	,,	...	...	...	...		...	...		...	...		...	...	...	...	...		...	...	...	...	12. 3	...			...
St-Riquier	,,	...	...	...	...		...	...		...	...		...	...	...	10.37	...		...	...	...	...	12.16	...			...
Domart	,,	...	...	...	...		...	...		...	...		...	...	...	...	...		...	...	...	...	12.26	...			...
Vignacourt	,,	...	...	...	...		...	...		8.55	...		...	...	...	Main	...		...	...	...	...	12.34	...			...
Amiens	arr.	...	...	...	...		...	...		9.11	...		...	...	...	11. 0	...		...	...	...	...	12.50	...			...
	dép.	...	...	...	...		...	...		9.15	...		...	...	10.15	11. 4	...		...	...	...	...	...	...			...
Sains	,,	...	...	...	...		...	...		9.23	...		...	...	10.23		...		...	...	...	...	...	...			...
Ailly-sur-Noye...	,,	...	...	...	...		...	...		9.30	...		...	...	10.30		...		...	...	...	...	...	...			...
La Faloise ...	,,	...	...	...	...		...	...		9.38	...		...	...	10.38		...		...	...	...	...	...	...			...
Breteuil ...	,,	...	...	...	9.32		...	...		9.47	...		...	...	10.47		...		...	...	...	...	...	...			...
Montreuil-sur-Brêche	arr.	...	...	...	9.43		...	...		10. 0	...		...	...	11. 0		...		...	...	...	...	...	...			...
	dép.	...	...	9.26	9.45		...	...		10. 2	...		10. 7	...	11. 2		...		11. 7	...	...	...	...	...			...
Fay-St-Quentin ...	,,	...	...	9.35			...	...			...		10.16	...			...		11.16	...	...	...	...	...			...
Bresles	,,	...	...	9.39			...	...			...		10.20	...			...		11.20	...	...	...	...	...			...
Hermes	,,	...	9.26	9.47			...	...			...		10.28	...			...		11.28	...	...	...	...	...			...
Cauvigny	,,	...	9.35				...	...			...		10.36	11. 0			...		11.36	...	...	...	...	...			...
Dieudonne	,,	...	9.43				...	...			...		10.45	11. 9			...		11.45	...	...	...	...	...			...
Chambly-Fresnoy ...	,,	9.38	9.49				...	...			...		10.52	11.16		O.S.	...		11.52	...	...	...	...	...			...
Beaumont-Persan ...	arr.	9.44	...				...	...		10.27	...		10.58	11.22	11.27	11.40	...		11.58	...	...	...	...	...			...
	dép.	9.45	...				10.10	...		10.30	...		11. 0	...	11.30	11.42	...		12. 0	...	...	...	...	...			...
Paris	arr.	10. 5	10.10	10.15	10.20	10.30	10.30	...	10.50	10.50	...	11.15	11.20	...	11.50	12. 0	...	12. 0	12.20	...	...	...	...	...	12.45	12.50	...
Platform		OS	OS	OS	OS	M	OS		M	OS		M	OS		OS	OS		M	OS						M	M	

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor

7. FRENCH SECTION UP TRAINS—*continued.*

Train No.		15	65	53	10	60	45	69	70	11	63	71	52	46	16	9	50	12	64	38	68	69	70	17	65	59
Londres	dép.	10.30	...	...	10 45	...	...	...	...	11.30	...	...	...	...	12. 5	...	...	12.40	...	...	...	...	...	13.20	...	...
Ashford	,,		...	...		...	...	...	...		...	...	...	...		12.52	...		...	...	...	...	...		...	...
Wissant-Marquise	,,		...	...		...	11.50	12. 0	12.15		...	12.50	...	13. 5			...		...	13.30	13.45	14.10	14.25		...	...
Ambleteuse	,,		...	...		...	11.58	12. 6	12.21		...	12.56	...	13.13			...		...	13.38	13.51	14.16	14.31		...	...
Wimereux	,,		...	...		...	12. 4	12.11	12.26		...	13. 1	...	13.19			...		...	13.44	13.56	14.21	14.36		...	...
Boulogne	arr.	11.55	...	...		...	12.10	12.17	12.32		...	13. 7	...	13.25	13.30	13.47	...		...	13 50	14. 2	14.27	14.42	14.45	...	...
	dép.	...	...	...		...	12.15	12.20	12.35		...	13.10	...	13.30	...	...	...		...	13.55	14. 5	14.30	14.45	...	...	...
Pont-de-Briques	,,	...	...	...		...		12.26	12.41		...	13.16	...		...	...	...		...	...	14.11	14.36	14.51	...	...	...
Nesles	,,	...	...	...		...		12.34	12.49		...	13.24	...		...	...	...		...	...	14.19	14.44	14.59	...	...	...
Frencq	,,	...	...	...		...		12.44	12.59		...	13.34	...		...	...	...		...	14.10	14.29	14.54	...	...	...	...
Montreuil-sur-Mer	,,	...	...	...		...		12.55	13.10		...	13.45	...		...	...	...		...	14.20	14.40	15. 5	...	...	...	...
Argoules	,,	...	...	...		...		...	...		...	...	...		...	...	...		...	...	...	...	...	...	...	...
Crecy	,,	...	...	...		...		...	...		...	...	...		...	...	...		...	...	...	...	...	...	...	...
St-Riquier	,,	...	...	...		...		...	...		...	...	...		...	...	...		...	14.42	...	...	...	...	...	...
Domart	,,	...	...	...		...		...	...		...	...	...		...	...	...		...	...	...	...	...	...	...	...
Vignacourt	,,	...	...	...		...		...	...		...	...	...		...	...	...		...	...	...	...	...	...	...	...
Amiens	arr.	...	...	...		...	13. 0	...	...		...	...	...		...	...	...		...	15. 5	...	...	...	...	...	...
	dép.	...	11.15	...		12.15	13. 4	...	...		...	...	13.15		...	...	...		14.15	15. 9	...	...	...	...	...	...
Sains	,,	...	11.23	...		12.23		...	...		...	...	13.23		...	...	...		14.23	Main	...	...	...	...	...	...
Ailly-sur-Noye	,,	...	11.30	...		12.30		...	...		...	...	13.30		...	...	...		14.30		...	...	...	...	...	...
La Faloise	,,	...	11.38	...		12.38		...	...		...	...	13.38		...	...	...		14.38		...	...	...	...	...	...
Breteuil	,,	...	11.47	...		12.47		...	...		...	...	13.47		...	...	...		14.47		...	...	...	...	...	...
Montreuil-sur-Brêche	arr.	...	12. 0	...		13. 0		...	...		...	...	14. 0		...	...	...		15. 0		...	...	...	...	...	...
	dép.	...	12. 2	12. 7		13. 2		...	...		13. 7	...	14. 2		...	...	14. 7		15. 2		...	...	...	...	15. 7	...
Fay-St-Quentin	,,	...		12.16				...	...		13.16	...			...	...	14.16				...	...	...	...	15.16	...
Bresles	,,	...		12.20				...	...		13.20	...			...	...	14.20				...	...	...	...	15.20	...
Hermes	,,	...		12.28				...	...		13.28	...			...	...	14.28				...	...	...	...	15.28	...
Cauvigny	,,	...		12.36				...	...		13.36	...			...	...	14 36				...	...	...	...	15.36	...
Dieudonne	,,	...		12.45				...	...		13.45	...			...	...	14.45				...	...	...	...	15.45	...
Chambly-Fresnoy	,,	...		12.52				...	...		13.52	...			...	...	14.52			OS	...	...	...	...	15.52	...
Beaumont-Persan	arr.	...	12.27	12.58		13.27		...	...		13.58	...	14.27		...	...	14.58		15.27	15.45	...	...	...	...	15.58	...
	dép.	...	12.30	13. 0		13.30		...	...		14. 0	...	14.30		...	...	15. 0		15.30	15.47	...	...	...	...	16. 0	16.20
Paris	arr.	...	12.50	13.20	13.30	13.50	13.50	...	...	14.15	14.20	...	14.50	14.50	...	...	15.20	15.25	15.50	16. 5	...	...	...	...	16 20	16.40
Platform			OS	OS	M	OS	M			M	OS		OS	M			OS	M	OS	OS					OS	OS

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8

7. FRENCH SECTION UP TRAINS—*continued.*

Train No.		13	47	14	51	39	71	60	62	7	68	52	70	1	61	53	41	49	69	71	60	2	64	58	65	57
Londres	*dép.*	13.30	...	14. 0	...	...	...	...	...	14.30	...	...	...	14.45	...	...	...	...	...	...	...	15.30	...	...	...	...
Ashford	„		...		...	...	...	...	...		...	...	...		...	...	...	...	...	...	...		...	...	...	...
Wissant-Marquise ...	„		14.40		...	15. 5	15.15	...	...		15.40	...	15.50		...	...	15.53	16. 0	16.10	16.33	...		...	...	...	...
Ambleteuse	„		14.48		...	15.13	15.21	...	...		15.46	...	...		...	...	16. 0	16. 7	...	16.39	...		...	...	...	...
Wimereux	„		14.54		...	15.19	15.26	...	...		15.51	...	...		...	...	16. 5	16.12	...	16.44	...		...	...	...	...
Boulogne	*arr.*		15. 0		...	15.25	15.32	...	...	15.55	15,57	...	16. 2		...	...	16.11	16.18	16.22	16.50	...		...	...	...	...
	dép.		15. 5		...	15.30	15.35	...	...	...	16. 0	...	16. 5		...	...	16.15	16.20	16.25	16.53	...		...	...	...	...
Pont-de-Briques ...	„		15.11		...		...	...	...	...	16. 6	...	...		...	...		16.26	16.31	16.59	...		...	...	...	...
Nesles	„		15.19		...		15.46	...	...	...	16.14	...	...		...	...		16.34	16.39	17. 7	...		...	...	...	...
Frencq	„		15.29		...		...	...	...	...	...	...	...		...	...		16.44	16.49	17.17	...		...	...	...	...
Montreuil-sur-Mer ...	„		15.40		...		...	...	...	...	...	...	16.25		...	...		16.55	17. 0	17.28	...		...	...	...	...
Argoules	„		15.53		...		...	...	...	...	...	...	...		...	...		17 8	...	...	...		...	...	...	...
Crecy	„		16. 3		...		...	...	...	...	...	...	...		...	...		17.18	...	...	...		...	...	...	...
St-Riquier	„		16.16		...		...	...	...	...	...	...	...		...	...		17.31	...	...	...		...	...	...	...
Domart	„		16.26		...		...	...	...	...	...	...	...		...	...		17.41	...	...	...		...	...	...	...
Vignacourt	„		16.34		...		...	...	...	...	...	...	...		...	...		17.49	...	...	...		...	...	...	...
Amiens	*arr.*		16.50		...		...	...	...	...	...	...	...		...	...	17. 0	18. 5	...	...	...		...	...	...	...
	dép.		...		15.15		...	...	...	...	...	...	...		...	16.15	17. 4	...	...	...	...		...	...	...	...
Sains	„		...		15.23		...	...	...	...	...	...	...		...	16 23		...	...	...	...		...	...	...	...
Ailly-sur-Noye... ...	„		...		15.30		...	...	...	...	...	...	...		...	16.30		...	...	...	...		...	...	...	...
La Faloise	„		...		15.38		...	...	...	...	...	...	...		...	16.38		...	...	...	...		...	...	...	...
Breteuil	„		...		15.47		...	...	...	...	...	...	...		...	16.47		...	...	...	...		...	...	...	17.40
Montreuil-sur-Brêche	*arr.*		...		16. 0		...	...	...	...	...	...	...		...	17. 0		...	...	...	...		...	...	...	17.53
	dép.		...		16. 2		...	...	16. 7	...	...	16.41	...		...	17. 2		...	...	...	...		17. 7	...	17.44	17.54
Fay-St-Quentin ...	„		...				...	...	16.16	...	...	16.50	...		...			...	...	...	...		17.16	...	...	18. 3
Bresles	„		...				...	...	16.20	...	...	16.54	...		...			...	...	...	...		17.20	...	17.54	
Hermes	„		...				...	...	16.28	...	...	17. 2	...		...			...	...	...	...		17.28	...	18. 2	
Cauvigny	„		...				...	...	16.36	...	...		...		...			...	...	...	...		17.36	17.48		
Dieudonne	„		...				...	...	16.45	...	...		...		...			...	...	...	...		17.45	17.57		
Chambly-Fresnoy ...	„		...				...	16.43	16.52	...	...		...		...			...	...	...	...		17.52	18. 4		
Beaumont-Persan ...	*arr.*		...		16.27		...	16.49	16.58	...	...		...		...	17.27		...	...	...	...		17.58	...		
	dép.		...		16.30		...	16.50	17. 0	...	...		...		17.20	17.30		...	...	...	17.50		18. 0	...		
Paris	*arr.*	16.15	...	16.45	16.50	16.50	...	17.10	17.20	...	...	17.30	...	17.30	17.40	17.50	17.50	...	...	...	18.10	18.15	18.20	18.25	18.30	18.35
Platform		M		M	OS	M		OS	OS			OS		M	OS	OS	M				OS	M	OS	OS	OS	OS

M.—Main Line Platforms, Nos. 1-4.

O.S.—Outer Suburban Platforms, Nos. 5-8.

7. FRENCH SECTION UP TRAINS—*continued.*

TRAIN No.		16	68	61	3	63	42	8	70	4	55	59	48	5	62	50	9	62	6	52	51	44	69	10	65	68
Londres ...	... *dép.*	...	...	...	16. 0	...	...	16.10	...	16.30	...	...	...	17. 0	...	...	17.10	...	17.45	...	...	...	...	18.15	...	...
Ashford ...	... „	16. 5	...	...		...	...		...		...	...	...		...	...		...		...	...	...	...		...	...
Wissant-Marquise ...	... „		17. 3	...		...	17. 6		17.25		...	...	17.40		...	...		...		...	...	18.25	18.40		...	19.25
Ambleteuse ...	... „		17. 9	..		...	17.13		17.31		...	...	17.48		...	...		...		...	...	18.33	18.46		...	19.31
Wimereux ...	... „		17.14	...		...	17.19		17.36		...	...	17.54		...	...		...		...	...	18.39	18.51		...	19.36
Boulogne ...	... *arr.*	17. 0	17.20	...		...	17.25	17.35	17.42		...	...	18. 0		...	...	18.35	...		...	...	18.45	18.57		...	19.42
	dép.	...	17.22	...		...	17.30	...	17.50		...	...	18. 5		...	...	...	...		...	...	18.50	19. 0		...	19.45
Pont-de-Briques ...	... „	...	17.28	...		...		...	17.56		...	...	18.11		...	...	...	...		...	...	...	19. 6		...	19.51
Nesles ...	... „	...	17.36	...		...		...	18. 4		...	...	18.19		...	...	...	...		...	...	...	19.14		...	19.59
Frencq ...	... „	...	17.46	...		...		...	18.14		...	...	18.29		...	...	...	...		...	...	19. 5	...		...	20. 9
Montreuil-sur-Mer ...	... „	...	17.57	...		...		...	18.25		...	...	18.40		...	...	...	...		...	...	19.15	...		...	20.20
Argoules ...	... „	...	...	...		...		...	...		...	...	18.53		...	...	...	...		...	...	...	...		...	...
Crecy	... „	...	...	...		...		...	...		...	...	19. 3		...	...	...	...		...	...	...	...		...	...
St-Riquier ...	... „	...	...	...		...		...	...		...	...	19.16		...	...	...	...		...	...	19.37	...		...	...
Domart ...	... „	...	...	...		...		...	...		...	...	19.26		...	...	...	...		...	...	...	...		...	...
Vignacourt ...	... „	...	...	...		...		...	...		...	...	19.34		...	...	...	...		...	...	Main	...		...	...
Amiens ...	... *arr.*	...	...	...		...		...	...		...	...	19.50		...	...	...	...		...	...	20. 0	...		...	...
	dép.	...	...	...		17.15		...	...		...	...	...		...	18.15	...	...		...	19.15	20. 4	...		...	...
Sains	... „	...	...	...		17.23		...	...		...	...	...		...	18.23	...	...		...	19.23		...		...	...
Ailly-sur-Noye	... „	...	...	...		17.30		...	...		...	...	...		...	18.30	...	...		...	19.30		...		...	...
La Faloise ...	... „	...	...	...		17.38		...	...		...	...	...		...	18.38	...	...		...	19.38		...		...	...
Breteuil ...	... „	...	...	...		17.47		...	...		...	...	...		18.40	18.47	...	...		...	19.47		...		...	...
Montreuil-sur-Brêche	*arr.*	...	...	...		18. 0		...	...		...	...	...		18.55	19. 0	...	...		...	20. 0		...		...	...
	dép.	...	...	...		18. 2		...	...		18. 7	...	...		...	19. 2	...	19. 7		...	20. 2		...		20. 7	...
Fay-St-Quentin	... „	...	...	...		...		...	...		18.16	...	...		...		...	19.16		...			...		20.16	...
Bresles	... „	...	...	...		...		...	...		18.20	...	...		...		...	19.20		...			...		20.20	...
Hermes ...	... „	...	...	...		...		...	...		18.28	18.43	...		...		...	19.28		...			...		20.28	...
Cauvigny ...	... „	...	...	...		...		...	...		18.36	18.51	...		...		...	19.36		19.51			...		20.36	...
Dieudonne ...	... „	...	...	...		...		...	...		18.45	19. 0	...		...		...	19.45		20. 0			...		20.45	...
Chambly-Fresnoy	... „	...	...	...		...		...	...		18.52	19. 7	...		...		...	19.52		20. 7		O.S.	...		20.52	...
Beaumont-Persan	... *arr.*	...	...	...		18.27		...	...		18.58	19.13	...		...	19.27	...	19.58		20.13	20.27	20.40	...		20.58	...
	dép.	...	...	18.25		18.30		...	...		19. 0	19.15	...		...	19.30	...	20. 0		20.15	20.30	20.42	...		21. 0	...
Paris	... *arr.*	...	...	18.45	18.45	18.50	18.50	...	...	19.15	19.20	19.35	...	19.45	...	19.50	...	20.20	20.30	20.35	20.50	21. 0	...	21. 0	21.20	...
PLATFORM				OS	M	OS	M			M	OS	OS		M		OS		OS	M	OS	OS	OS		M	OS	

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

7. FRENCH SECTION UP TRAINS—*continued.*

Train No.	7	56	40	67	70	15	64	11	63	45	69	12	54	55	49	17	68	46	66	13	47	69	67	14	16
Londres ... ... *dép.*	...	...	...	...	...	**18.45**	...	**19.15**	...	...	...	**20. 0**	...	...	...	**20.30**	...	...	...	**22. 0**	...	...	...	**23.50**	**0. 0**
Ashford ... ... „	18.50	...	...	...	...		...		...	...	...		...	...	...		...	...	...		...	...	...		
Wissant-Marquise ... „		...	19.35	...	19.50		...		...	20. 5	20.30		...	...	20.50		21.45	21.50	...		22.40	23.10	...		
Ambleteuse ... ... „		...	19.43	...	19.56		...		...	20.13	...		...	...	20.58		21.51	21.58	...		22.48	23.16	...		
Wimereux ... ... „		...	19.49	...	20. 1		...		...	20.19	...		...	...	21. 4		21.56	22. 4	...		22.54	23.21	...		
Boulogne ... *arr.*	**19.45**	...	19.55	...	20. 7	**20.10**	...		...	20.25	20.42		...	...	21.10	**21.55**	22. 2	22.10	...		23. 0	23.27	...		**1. 25**
Boulogne ... *dép.*	...	...	20. 0	...	20.10	...	...		...	20.30	20.45		...	...	21.15	...	22. 5	22.15	...		23. 5	23.30	...		...
Pont-de-Briques ... „	...	...		...	20.16	...	...		...	...	20.51		...	...	...	...	22.11		...		...	23.36	...		...
Nesles ... ... „	...	...		...	20.24	...	...		...	...	20.59		...	...	...	...	22.19		...		...	23.44	...		...
Frencq ... ... „	...	...		...	20.34	...	...		...	20.45	21. 9		...	...	21.30	...	22.29		...		23.20	...	...		...
Montreuil-sur-Mer ... „	...	...		...	20.45	...	...		...	20.55	21.20		...	...	21.40	...	22.40		...		23.30	...	...		...
Argoules ... ... „	...	...		...	...	...	...		...	...	...		...	...	21.53	...	...		...		...	...	...		...
Crecy ... ... „	...	...		...	...	...	...		...	...	...		...	...	22. 3	...	...		...		...	...	...		...
St-Riquier ... ... „	...	...		...	...	...	...		...	21.17	...		...	...	22.16	...	...		...		23.52	...	...		...
Domart ... ... „	...	...		...	...	...	...		...	...	...		...	...	22.26	...	...		...		...	...	...		...
Vignacourt ... ... „	...	...		...	...	...	...		...	...	...		...	...	22.34	...	...		...		...	...	...		...
Amiens ... *arr.*	...	...		...	...	...	...		...	21.40	...		...	...	22.50	...	...	23. 0	...		0. 15	...	0.30		...
Amiens ... *dép.*	...	20.10		...	...	...	20.15		...	21.44	...		...	21.55	...	...	...	23. 4	23.15		...	...			...
Sains ... ... „	...	...		...	...	...	20.23		...		...		...	22. 3	...	...	...		23.23		...	...			...
Ailly-sur-Noye... ... „	...	...		...	...	...	20.30		...		...		...	22.10	...	...	...		23.30		...	...			...
La Faloise ... ... „	...	...		...	...	...	20.38		...		...		...	22.18	...	...	...		23.38		Les mercredis et samedis	...			...
Breteuil ... ... „	...	20.28		...	...	...	20.47		...		...		...	22.27	...	...	...		23.47			...	0.47		...
Montreuil-sur-Brêche *arr.*	...	20.40		...	...	...	21. 0		...		...		...	22.40	...	...	...		0. 0			...	0.58		...
Montreuil-sur-Brêche *dép.*	...	...		...	...	...	21. 2		21. 7		...		22. 7	22.42	...	...	...		0. 2			...	1. 0		...
Fay-St-Quentin ... „	...	...		...	...	...			21.16		...		22.16	22.51	...	...	...		0.11			...			...
Bresles ... ... „	...	...		...	...	...			21.20		...		22.20	22.55	...	...	...		0.15			...			...
Hermes ... ... „	...	...		20.43	...	...			21.28		...		22.28	23. 3	...	...	...		0.23			...			...
Cauvigny ... ... „	...	...		20.51	...	...			21.36		...		22.36	23.11	...	...	...		0.31			...			...
Dieudonne ... ... „	...	...		21. 0	...	...			21.45		...		22.45	23.20	...	...	...		0.40			...			...
Chambly-Fresnoy ... „	...	...		21. 7	...	...			21.52		...		22.52	22.27	...	...	...		0.47			...			...
Beaumont-Persan ... *arr.*	...	...		21.13	...	...	21.27		21.58	22.20	...		22.58	23.33	...	...	...		0.53		...	...	1.23		...
Beaumont-Persan ... *dép.*	...	...		21.15	...	...	21.30		22. 0	22.22	...		23. 0	23.35	...	...	...		0.55		...	...	1.25		...
Paris ... ... *arr.*	...	...	**21.20**	**21.35**	...	...	**21.50**	**22. 0**	**22.20**	**22.40**	...	**22.45**	**23.20**	**23.55**	...	...	...	**23.50**	**1.15**	**0.45**	...	...	**1.45**	**2.35**	...
Platform			**M**	**OS**			**OS**	**M**	**OS**	**OS**		**M**	**OS**	**OS**				**M**	**OS**	**M**			**OS**	**M**	

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

8. FRENCH SECTION DOWN TRAINS

Train No. / Platform	10 M	70	62 OS	71	15	49	63 OS	11 M	16	68	7	70	44 M	53 OS	12 M	50 OS	RM	45 M	17	61 OS	71	64 OS	13 M	57 OS	54 OS
Paris ... ... *dép.*	5.15	...	5.30	...	...	...	6.30	7. 0	...	...	...	...	7.10	7.15	7.45	7.45	...	8. 0		8. 8	...	8.15	8.30	8.40	8 44
Beaumont-Persan ... *arr*	↓	...	5.50	...	...	...	6.50	↓	...	...	...	...	↓	7.35	↓	8. 5	8.16	↓	...	8.28	...	↓	↓	↓	↓
dép.	↓	...	5.53	...	...	...	6.53	↓	...	...	...	...	↓	7.37	↓	8. 8	8.17	↓	...	...	...	↓	↓	↓	↓
Chambly-Fresnoy ... ,,	↓	...	5.59	...	...	...	6.59	↓	...	...	...	...	↓	7.43	↓	↓	8.22	↓	...	...	...	↓	↓	↓	↓
Dieudonne ... ... ,,	↓	...	6. 6	...	...	...	7. 6	↓	...	...	...	...	↓	7.50	↓	↓	8.28	↓	...	...	...	↓	↓	↓	↓
Cauvigny ... ... ,,	↓	...	6.15	...	...	...	7.15	↓	...	...	...	...	↓	7.59	↓	↓	8.35	↓	...	...	...	8.41	↓	↓	↓
Hermes ... ... ,,	↓	...	6.23	...	...	...	7.23	↓	...	...	...	...	↓	8. 7	↓	↓	Motor from Ecouen, *dép.* 7.59	↓	...	...	...	8.49	↓	↓	9.12
Bresles ... ... ,,	↓	...	6.31	...	...	...	7.31	↓	...	...	...	...	↓	8.15	↓	↓		↓	...	...	...	8.57	↓	↓	...
Fay-St-Quentin ... ,,	↓	...	6.35	...	...	...	7.35	↓	...	...	...	...	↓	8.19	↓	↓		↓	...	...	...	9. 1	↓	↓	...
Montreuil-sur-Brêche *arr*	↓	...	6.44	...	...	...	7.44	↓	...	...	...	...	↓	8.28	↓	8.33		↓	...	...	...	9.10	↓	↓	...
dép.	↓	...	6.45	...	...	...	7.45	↓	...	...	...	...	↓	...	↓	8.35		↓	...	...	...	...	↓	↓	...
Breteuil ... ... ,,	↓	...	6.58	...	...	...	7.58	↓	...	...	...	...	↓	...	↓	8.48		↓	...	...	...	...	↓	9.20	...
La Faloise ... ,,	↓	...	7. 7	...	...	...	8. 7	↓	...	...	...	...	↓	...	↓	8.57		↓	...	...	...	...	↓	...	...
Ailly-sur-Noye ... ,,	↓	...	7.15	...	...	...	8.15	↓	...	...	...	...	↓	...	↓	9. 5		↓	...	...	...	...	↓	...	...
Sains ... ... ,,	slip	...	7.22	...	...	...	8.22	↓	...	...	...	...	↓	...	↓	9.12		↓	...	...	...	...	↓	...	...
Amiens ... *arr.*	6. 5	...	7.30	...	...	...	8.30	↓	...	...	...	...	7.56	...	↓	9.20		↓	...	...	...	...	↓	...	...
dép.	↓	...	..	...	...	6.30	8.34	↓	...	...	...	...	8. 0	...	↓	...		↓	...	...	...	...	↓	...	...
Vignacourt ... ,,	↓	...	...	...	...	6.46	8.50	↓	...	...	...	...	...	...	↓	...		↓	...	...	...	...	↓	...	...
Domart ... ,,	↓	...	...	...	...	6.54	...	↓	...	...	...	...	...	...	↓	...		↓	...	...	...	...	↓	...	...
St-Riquier ... ,,	↓	...	...	...	...	7. 4	...	↓	...	...	...	...	8.22	...	↓	...	...	↓	...	...	...	...	↓	...	...
Crecy ... ,,	↓	...	...	...	...	7.17	...	↓	...	...	...	...	...	...	↓	...	...	↓	...	...	...	...	↓	...	...
Argoules ... ,,	↓	...	...	...	...	7.27	...	↓	...	...	...	...	...	...	↓	...	...	↓	...	...	...	...	↓	...	...
Montreuil-sur-Mer ... ,,	↓	6.10	...	6.40	...	7.40	...	↓	...	7.55	...	...	8.45	...	↓	...	...	↓	...	...	9.15	...	↓	...	...
Frencq ... ,,	↓	6.21	...	6.51	...	7.51	...	↓	...	8. 6	...	...	8.55	...	↓	...	...	↓	...	...	9.26	...	↓	...	...
Nesles ... ,,	↓	6.31	...	7. 1	...	8. 1	...	↓	...	8.16	...	8.46	...	...	↓	...	...	↓	...	...	9.36	...	↓	...	...
Pont-de-Briques ... ,,	slip	6.39	...	7. 9	...	8. 9	...	↓	...	8.24	...	8.54	...	...	↓	...	...		...	...	9.44	...	↓	...	...
Boulogne ... *arr.*	6.40	6.45	...	7.15	...	8.15	...	↓	...	8.30	...	9. 0	9.10	...	↓	...	...	9.20	...	...	9.50	...	↓	...	...
dép.	↓	6.48	...	7.18	7.30	8.20	...	↓	8.35	8.33	8.45	9. 3	9.15	...	↓	...	...	9.25	9.30	...	9.53	...	↓	...	...
Wimereux ... ,,	↓	6.54	...	7.24	↓	8.26	...	↓	↓	8.39	↓	9. 9	9 21	...	↓	...	...	9.31	↓	...	9.59	...	↓	...	...
Ambleteuse ... ,,	↓	6.59	...	7.29	↓	8.32	...	↓	↓	8.44	↓	9.14	9.27	...	↓	...	...	9.37	↓	...	10. 4	...	↓	...	...
Wissant-Marquise ... *arr.*	↓	7. 5	...	7.35	↓	8.40	...	↓	↓	8.50	↓	9.20	9.35	...	↓	...	...	9.45	↓	...	10.10	...	↓	...	...
Ashford ... ... *arr.*	↓	...	...	...	↓	...	...	↓	↓	...	9.40	...	...	...	↓	...	...	...	↓	...	...	...	↓	...	...
Londres ... ... *arr.*	8. 0	...	...	...	8.55	...	...	9.45	10. 0	...	...	...	...	...	10.30	...	...	...	10.55	...	...	...	11.15	...	...

M.—Main Line Platforms, Nos 1—4. **O.S.**—Outer Suburban Platforms, Nos. 5–8. **R.M.**—Rail Motor.

Train No. ... ... / Platform	46 M	68	69	65 OS	61 OS	14 M	51 OS	60 OS	62 OS	38 M	47	1 M	61 OS	9	70	7	53 OS	2 M	71	39 OS	52 OS	63 OS	3 M	68	8	64 OS
Paris ... ... dép.	8.45	...	...	8.49	9. 5	9.15	9.15	9.38	9.45	10. 0	...	10. 5	10. 8	...	...	...	10.15	10.40	...	10.40	10.45	11.15	11.30	...	...	11.45
Beaumont-Persan ... arr.	↓	...	...	9. 8	...	↓	9.35	9.58	10. 5	↓	...	↓	10 28	...	...	...	10.35	↓	...	10.58	11. 5	11.35	↓	...	...	12. 5
Beaumont-Persan ... dép.	↓	...	...	9. 9	...	↓	9.37	...	10. 8	↓	...	↓	...	...	...	...	10.37	↓	...	11. 0	11 .8	11.37	↓	...	...	12. 8
Chambly-Fresnoy ... ,,	↓	...	...	↓	9.26	↓	9.43	...	↓	↓	...	↓	...	...	...	...	10.43	↓	...	Main	↓	11.43	↓	...	...	↓
Dieudonne ... ... ,,	↓	...	...	↓	...	↓	9.50	...	↓	↓	...	↓	...	...	...	...	10.50	↓	...	↓	↓	11.50	↓	...	...	↓
Cauvigny ... ... ,,	↓	...	...	↓	...	↓	9.59	...	↓	↓	...	↓	...	...	...	...	10.59	↓	...	↓	↓	11.59	↓	...	...	↓
Hesmes ... ... ,,	↓	...	...	↓	...	↓	10. 7	...	↓	↓	...	↓	...	...	...	...	11. 7	↓	...	↓	↓	12. 7	↓	...	...	↓
Bresles ... ... ,,	↓	...	...	↓	...	↓	10.15	...	↓	↓	...	↓	...	...	...	...	11.15	↓	...	↓	↓	12.15	↓	...	...	↓
Fay-St-Quentin ... ,,	↓	...	...	↓	...	↓	10.19	...	↓	↓	...	↓	...	...	...	...	11.19	↓	...	↓	↓	12.19	↓	...	...	↓
Montreuil-sur-Brêche arr.	↓	...	...	9.33	...	↓	10.28	...	10.33	↓	...	↓	...	...	...	...	11.28	↓	...	↓	11.33	12.28	↓	...	...	12.33
Montreuil-sur-Brêche dép.	↓	...	...	9.35	...	↓	...	...	10.35	↓	...	↓	...	...	...	...	...	↓	...	↓	11.35	...	↓	...	...	12.35
Breteuil ... ... ,,	↓	...	...	9.48	...	↓	...	...	10.48	↓	...	↓	...	...	...	...	...	↓	...	↓	11.48	...	↓	...	...	12.48
La Faloise ... ... ,,	↓	...	...	9.57	...	↓	...	...	10.57	↓	...	↓	...	...	...	...	...	↓	...	↓	11.57	...	↓	...	...	12.57
Ailly-sur-Noye ... ,,	↓	...	...	10. 5	...	↓	...	...	11. 5	↓	...	↓	...	...	...	...	...	↓	...	↓	12. 5	...	↓	...	...	13. 5
Sains ... ... ,,	...	...	...	10.12	...	↓	...	...	11.12	↓	...	↓	...	...	...	...	...	↓	...	Local	12.12	...	↓	...	...	13.12
Amiens ... arr.	9.31	...	...	10.20	...	↓	...	...	11.20	↓	...	↓	...	...	...	...	...	↓	...	11 36	12.20	...	↓	...	...	13.20
Amiens ... dép.	9.35	...	...	...	...	↓	...	...	...	↓	9.40	↓	...	...	...	...	...	↓	...	11.40	...	...	↓	...	...	...
Vignacourt ... ,,	↓	...	...	...	...	↓	...	...	...	↓	9.56	↓	...	...	...	...	...	↓	...	...	...	...	↓	...	...	...
Domart ... ... ,,	↓	...	...	...	...	↓	...	...	...	↓	10. 4	↓	...	...	...	...	...	↓	...	...	...	...	↓	...	...	...
St-Riquier ... ,,	↓	...	...	...	...	↓	...	...	...	↓	10.14	↓	...	...	...	...	...	↓	...	12. 2	...	...	↓	...	...	...
Crecy ... ... ,,	↓	...	...	...	...	↓	...	...	...	↓	10.27	↓	...	...	...	...	...	↓	...	...	...	...	↓	...	...	...
Argoules ... ,,	↓	...	...	...	...	↓	...	...	...	↓	10.37	↓	...	...	...	...	...	↓	...	...	...	...	↓	...	...	...
Montreuil-sur-Mer ... ,,	↓	...	...	...	...	↓	...	...	...	↓	10.50	↓	...	...	11. 0	...	...	↓	...	12.25	...	...	↓	12.30	...	...
Frencq ... ... ,,	↓	...	...	...	...	↓	...	...	...	↓	11. 1	↓	...	...	11.11	...	...	↓	11.46	12.35	...	...	↓	12.41	...	...
Nesles ... ... ,,	↓	10.46	10.56	...	...	↓	...	...	...	↓	11.11	↓	...	...	11.21	...	...	↓	11.56	...	...	...	↓	12.51	...	...
Pont-de-Briques ... ,,	...	10.54	11. 4	...	...	↓	...	...	...	...	11.19	↓	...	...	11.29	...	...	↓	12. 4	...	...	...	↓	12 59	...	...
Boulogne ... arr	10.20	11. 0	11.10	...	...	↓	...	...	...	11.20	11.25	↓	...	...	11.35	...	...	↓	12.10	12.50	...	...	↓	13. 5	...	...
Boulogne ... dép.	10.25	11. 3	11.13	...	...	↓	...	...	...	11.25	11.30	↓	...	11.40	11.38	11.50	...	↓	12.13	12.55	...	...	↓	13. 8	13.20	...
Wimereux ... ,,	10.31	...	11.19	...	...	↓	...	...	...	11.31	11.36	↓	...	↓	11.44	↓	...	↓	12.19	13. 1	...	...	↓	13.14	↓	...
Ambleteuse ... ,,	10.37	...	11.24	...	...	↓	...	...	...	11.37	11.42	↓	...	↓	11.49	↓	...	↓	12.24	13. 7	...	...	↓	13.19	↓	...
Wissant-Marquise ... arr.	10.45	11.15	11.30	...	...	↓	...	...	...	11.45	11.50	↓	...	↓	11.55	↓	...	↓	12.30	13.15	...	...	↓	13.25	↓	...
Ashford ... ... arr.	...	...	...	...	...	↓	...	...	...	...	...	↓	...	12.35	...	↓	...	↓	...	...	...	...	↓	...	↓	...
Londres ... ... arr.	...	...	...	...	...	12. 0	...	...	...	...	...	12.50	...	...	...	13.15	...	13.25	...	...	...	...	14.15	...	14.45	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

8. FRENCH SECTION DOWN TRAINS—*continued.*

TRAIN No. ... ... PLATFORM	41 M	4 M	50 OS	69	70	42 M	51 OS	5 M	16	71	9	65 OS	68	6 M	53 OS	70	43 M	49	62 OS	69	10 M	15	71	68	44 OS	63 OS
Paris ... ... *dép.*	12. 0	12.15	12.15	...	...	12.45	12.45	13. 5	...	...	...	13.15	...	13.45	13.45	...	14. 0	...	14.15	...	14.30	...	...	...	14.35	14.45
Beaumont-Persan ... *arr.*			12.35	...	...		13. 5		...	...	...	13.35	...		14. 5	...		...	14.35	...		...	...	...	14.53	15. 5
Beaumont-Persan ... *dép.*			12.37	...	...		13. 8		...	...	...	13.37	...		14. 8	...		...	14.37	...		...	...	...	14.55	15. 8
Chambly-Fresnoy ... ,,			12.43	...	...				...	...	...	13.43	...			...		...	14.43	...		...	...	...	Main	
Dieudonne ... ... ,,			12.50	...	...				...	...	...	13.50	...			...		...	14.50	...		...	...	...		
Cauvigny ... ... ,,			12.59	...	...				...	...	...	13.59	...			...		...	14.59	...		...	...	...		
Hermes ... ... ,,			13. 7	...	...				...	...	...	14. 7	...			...		...	15. 7	...		...	...	...		
Bresles ... ... ,,			13.15	...	...				...	...	...	14.15	...			...		...	15.15	...		...	...	...		
Fay-St-Quentin ... ,,			13.19	...	...				...	...	...	14.19	...			...		...	15.19	...		...	...	...		
Montreuil-sur-Brêche *arr*			13.28	...	...		13.33		...	...	...	14.28	...		14.33	...		...	15.28	...		...	...	...		15.33
Montreuil-sur-Brêche *dép.*			...	...	...		13.35		...	...	...	...	...		14.35	...		...	...	...		...	...	...		15.35
Breteuil ... ... ,,			...	...	...		13.48		...	...	...	...	...		14.48	...		...	...	...		...	...	...		15.48
La Faloise ... ... ,,			...	...	...		13.57		...	...	...	...	...		14.57	...		...	...	...		...	...	...		15.57
Ailly-sur-Noye ... ,,			...	...	...		14. 5		...	...	...	...	...		15. 5	...		...	...	...		...	...	...		16. 5
Sains ... ... ,,			...	...	...		14.12		...	...	...	...	...		15.12	...		...	...	...		...	...	...	Local	16.12
Amiens ... ... *arr.*			...	...	...	13.31	14.20		...	...	...	...	...		15.20	...		...	...	...		...	...	...	15.31	16.20
Amiens ... ... *dép.*			...	...	...	13.35	...		...	...	...	...	...		...	...		13.45	...	...		...	...	...	15.35	...
Vignacourt ... ... ,,			...	...	...		...		...	...	...	...	...		...	...		14. 1	...	...		...	...	...	...	...
Domart ... ... ,,			...	...	...		...		...	...	...	...	...		...	...		14. 9	...	...		...	...	...	...	...
St-Riquier ... ... ,,			...	...	...		...		...	...	...	...	...		...	...		14.19	...	...		...	...	...	15.57	...
Crecy ... ... ,,			...	...	...		...		...	...	...	...	...		...	...		14.32	...	...		...	...	...	...	...
Argoules ... ... ,,			...	...	...		...		...	...	...	...	...		...	...		14.42	...	...		...	...	...	...	...
Montreuil-sur-Mer ... ,,			...	13.10	13.25		...		...	14. 0	...	...	14.45		...	...		14.55	...	15.15		...	...	...	16.20	...
Frencq ... ... ,,			...	13.21	13.36		...		...	14.11	...	...	...		...	...		15. 6	...	15.26		...	...	...	16.30	...
Nesles ... ... ,,			...	13.31	13.46		...		...	14.21	...	...	...		...	15. 5		15.16	...	15.36		...	15.53	16.21	...	...
Pont-de-Briques ... ,,			...	13.39	13.54		...		...	14.29	...	...	...		...	...		15.24	...	15.44		...	16. 1	16.29	...	...
Boulogne ... *arr.*	13.20		...	13.45	14. 0	14.20	...		...	14.35	...	...	15. 5		...	15.16	15.20	15.30	...	15.50		...	16. 7	16.35	16.45	...
Boulogne ... *dép.*	13.25		...	13.48	14. 3	14.25	...		14.40	14.38	14.55	...	15. 8		...	15.17	15.25	15.32	...	15.53		16. 5	16.10	16.38	16.50	...
Wimereux ... ... ,,	13.31		...	13.54	...	14.31	...			14.44		...	15.14		...	15.23	15.31	15.38	...	...			16.16	16.44	16.56	...
Ambleteuse ... ... ,,	13.37		...	13.59	...	14.37	...			14.49		...	15.19		...	15.28	15.37	15.44	...	...			16.21	16.49	17. 2	...
Wissant-Marquise ... *arr.*	13.45		...	14. 5	14.15	14.45	...			14.55		...	15.25		...	15.35	15.45	15.50	...	16. 5			16.27	16.55	17.10	...
Ashford ... ... *arr.*	...		...	...	...	...	...		15.35	...		...	...		...	...	...	...	...	...	17.15	17.30	...	...	...	...
Londres ... ... *arr.*	...	15. 0	...	...	...	...	...	15.50	...	...	16.20	...	...	16.30	...	...	...	...	...	...	...	...	...	...	...	...

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

8. FRENCH SECTION DOWN TRAINS—*continued.*

Train No.		11	17	70	52	50	12	64	45	7	69	16	60	57	65	13	68	58	61	70	46	51	40	55	59	60	14
Platform.		M			OS	OS	M	OS	M				OS	OS	OS	M		OS	OS		M	OS	M	OS	OS	OS	M
Paris	... dép.	15.15	...	...	15.15	15.45	16. 0	16. 0	16.10	...	...	...	16.10	16.35	16.40	16.45	...	16.45	16.50	...	17.0	17. 5	17.10	17.10	17.15	17.20	17.30
Beaumont-Persan	... arr.		...	...	15.35	16. 5		...		...	...	...	16.30				...	...	17.10	...					...	17.40	
	dép.		...	...	15.37	16. 8		...		...	...	...	16.31				...	...	...	...					...	...	
Chambly-Fresnoy	... ,,		...	...	15.43			...		...	...	...	16.37				...	17. 6	...	...					17.36	...	
Dieudonne ...	... ,,		...	...	15.50			16.23		...	...	...	...				...	17.13	...	...					17.43	...	
Cauvigny ...	... ,,		...	...	15.59			16.32		...	...	...	...				...	17.22	...	...					17.52	...	
Hermes ...	... ,,		...	...	16. 7			16.40		...	...	...	...		17. 8		...	...	...	...				17.38	18. 0	...	
Bresles ...	... ,,		...	...	16.15			16.48		...	...	...	...		17.16		...	...	...	...				17.46	...	...	
Fay-St-Quentin ...	,,		...	...	16.19			16.52		...	...	...	...		17.20		...	...	...	...				17.50	...	...	
Montreuil-sur-Brêche	arr.		...	...	16.28	16.33		17. 1		...	...	...	...	17.10	17.30		...	...	...	...		17.40		18 0	...	...	
	dép.		...	...	...	16.35		...		...	...	...	...	17.12	...		...	...	...	...		17.42		...	...	...	
Breteuil ...	... ,,		...	...	...	16.48		...		...	...	...	...	17.25	...		...	...	...	...		17.52		...	...	...	
La Faloise ...	... ,,		...	...	...	16.57		...		...	...	...	...	...	...		...	...	...	...		18. 6		...	...	...	
Ailly-sur-Noye	... ,,		...	...	...	17. 5		...		...	...	...	...	...	...		...	...	...	...		18.14		...	...	...	
Sains	... ,,		...	...	...	17.12		...		...	...	...	...	...	...		...	...	...	...	Local	18.21		...	...	...	
Amiens ...	... arr.		...	...	...	17.20		...		...	...	...	...	...	...		...	...	...	...	17.46	18.30		...	...	...	
	dép.		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	17.50	...		...	...	...	
Vignacourt ...	... ,,		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	...	...		...	...	...	
Domart ...	... ,,		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	...	...		...	...	...	
St-Riquier ...	... ,,		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	18.12	...		...	...	...	
Crecy	... ,,		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	...	...		...	...	...	
Argoules ...	... ,,		...	...	...	...		...		...	...	...	...	...	...		...	...	...	...	...	...		...	...	...	
Montreuil-sur-Mer	... ,,		...	16.35	...	...		...		...	17. 5	...	...	...	...		18.10	...	...	18.30	18.35	...		...	...	...	
Frencq ...	... ,,		...	16.46	...	...		...		...	17.16	...	...	...	...		18.21	...	...	18.41	18.46	...		...	...	...	
Nesles ...	... ,,		...	...	...	...		...		...	17.26	...	...	...	...		18.31	...	...	18.51	18.56	...		...	...	...	
Pont-de-Briques	... ,,		...	...	...	...		...		...	17.34	...	...	...	...		18.39	...	...	18.59	19. 4	...		...	...	...	
Boulogne ...	... arr.		...	17. 1	...	...		...	17.30	...	17.40	...	...	...	...		18.45	...	...	19. 5	19.10	...	18.30	...	...	...	
	dép.		17. 0	17. 3	...	...		...	17.35	17.40	17.48	17.55	...	...	...		18.48	...	...	19. 6	19.15	...	18.35	...	...	...	
Wimereux ...	... ,,			...	...	...		...	17.41		17.54		...	...	...		18.54	...	...	19.12	19.21	...	18.41	...	...	...	
Ambleteuse ...	... ,,			...	...	...		...	17.47		17.59		...	...	...		18.59	...	...	19.17	19.27	...	18.47	...	...	...	
Wissant-Marquise	... arr.			17.15	...	...		...	17.55		18. 5		...	...	...		19. 5	...	...	19.23	19.35	...	18.55	...	...	...	
Ashford ...	... arr.			...	...	...		...	...	18.35	...		...	...	...		...	...	...	...	...	...	...	...	...	...	
Londres ...	... arr.	18. 0	18.25	...	...	...	18.45	...	...	...	...	19.20	...	...	...	19.30	...	...	...	...	...	...	...	...	...	...	20.15

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

8. FRENCH SECTION DOWN TRAINS—*continued.*

Train No. ... ... / Platform	62 OS	56 OS	52 OS	47	38 M	61 OS	53 OS	1 M	66 OS	67 OS	60 OS	7	69	39 M	64 OS	65 OS	2 M	58 OS	61 OS	49	68	41 M	57 OS	63 OS	3 M
Paris ... ... dép.	17.40	17.45	17.50	...	17.55	17.55	18.10	18.15	18.15	18.20	18.25	...	...	18.45	18.45	18.50	18.55	18.55	19. 0	...	...	19. 5	19.10	19.15	19.45
Beaumont-Persan ... arr.	↓	↓	...	...	↓	18.15	↓	↓	↓	...	18.45	...	...	↓	↓	↓	↓	...	19.20	...	...	↓	...	19.35	↓
Beaumont-Persan ... dép.	↓	↓	...	...	↓	...	↓	↓	↓	...	18.46	...	...	↓	↓	↓	↓	...	...	...	...	↓	...	19.37	↓
Chambly-Fresnoy ... ,,	↓	↓	18.11	...	↓	...	↓	↓	↓	18.41	18.52	...	...	↓	↓	↓	↓	19.16	...	...	...	↓	19.31	19.43	↓
Dieudonne ... ... ,,	↓	↓	18.18	...	↓	...	↓	↓	↓	18.48	...	...	...	↓	↓	↓	↓	19.23	...	...	...	↓	19 38	19.50	↓
Cauvigny ... ... ,,	↓	↓	18.27	...	↓	...	↓	↓	↓	18.52	...	...	...	↓	↓	↓	↓	19.32	...	...	...	↓	19.47	19.59	↓
Hermes ... ... ,,	↓	18.13	...	...	↓	...	↓	↓	18.43	19. 5	...	...	...	↓	↓	19.18	↓	19.40	...	...	...	↓	19.55	20. 7	↓
Bresles ... ... ,,	↓	18.21	...	...	↓	...	↓	↓	18.51	...	...	...	...	↓	↓	19.26	↓	...	...	...	...	↓	...	20.15	↓
Fay-St-Quentin ... ,,		18.25	...	...	↓	...		↓	18.55	...	...	...	...	↓		19.30	↓	...	...	...	...	↓	...	20.19	↓
Montreuil-sur-Brêche arr.	18.15	18.35	...	...	↓	...	18.45	↓	19. 5	...	...	...	...	↓	19.20	19.40	↓	...	...	...	...	↓	...	20.28	↓
Montreuil-sur-Brêche dép.	18.17	18.37	...	...	↓	...	18.47	↓	19. 7	...	...	...	...	↓	19.22	...	↓	...	...	...	...	↓	...	...	↓
Breteuil ... ... ,,	18.30	18 50	...	...	↓	...	19. 0	↓	19.22	...	...	...	...	↓	19.37	...	↓	...	...	...	...	↓	...	...	↓
La Faloise ... ... ,,	...	18.59	...	...	↓	...	...	↓	...	...	...	...	...	↓	19.46	...	↓	...	...	...	...	↓	...	...	↓
Ailly-sur-Noye ... ,,	...	19. 7	...	...	↓	...	...	↓	...	...	...	...	...	↓	19.54	...	↓	...	...	...	...	↓	...	...	↓
Sains ... ... ,,	...	19 14	...	...		...	...	↓	...	...	...	...	...	↓	20. 1	...	↓	...	...	...	...		...	...	↓
Amiens ... ... arr.	...	19.22	...	...	18.41	...	...	↓	19.40	...	...	...	...	↓	20.10	...	↓	...	...	...	...	19.51	...	...	↓
Amiens ... ... dép.	...	...	...	17.55	18.45	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	18.50	...	19.55	...	...	↓
Vignacourt ... ... ,,	...	...	...	18.11	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	19. 6	...	...	...	...	↓
Domart ... ... ,,	...	...	...	18.19	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	19.14	...	...	...	...	↓
St-Riquier ... ... ,,	...	...	...	18.29	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	19.24	...	20.17	...	...	↓
Crecy ... ... ,,	...	...	...	18.42	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	19.37	...	...	...	...	↓
Argoules ... ... ,,	...	...	...	18.52	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	19.47	...	...	...	...	↓
Montreuil-sur-Mer ... ,,	...	...	...	19. 5	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	20. 0	20.25	20.40	...	...	↓
Frencq ... ... ,,	...	...	...	19.16	↓	...	...	↓	...	...	...	...	...	↓	...	...	↓	...	...	...	20.36	20.51	...	...	↓
Nesles ... ... ,,	...	...	...	19.26	↓	...	...	↓	...	...	...	...	19.46	↓	...	...	↓	...	...	...	20.46	21. 1	...	...	↓
Pont-de-Briques ... ,,	...	...	...	19.34		...	...	↓	...	...	...	...	19.54		...	...	↓	...	...	...	20.54	21. 9	...	...	↓
Boulogne ... ... arr.	...	...	...	19.40	19.30	...	...	↓	...	...	...	...	20. 0	20. 5	...	...	↓	...	...	20.20	21. 0	21.15	...	...	↓
Boulogne ... ... dép.	...	...	...	19.45	19.35	...	...	↓	...	...	...	20. 0	20. 3	20.10	...	...	↓	...	...	20.23	21. 3	21.20	...	...	↓
Wimereux ... ... ,,	...	...	...	19.51	19.41	...	...	↓	...	...	...	↓	20. 9	20.16	...	...	↓	...	...	20.29	21. 9	21.26	...	...	↓
Ambleteuse ... ... ,,	...	...	...	19.57	19.47	...	...	↓	...	...	...	↓	20.14	20.22	...	...	↓	...	...	20.34	21.14	21.32	...	...	↓
Wissant-Marquise ... arr.	...	...	...	20. 5	19.55	...	...	↓	...	...	...	↓	20.20	20.30	...	...	↓	...	...	20.40	21.20	21.40	...	...	↓
Ashford ... ... arr.	...	...	...	...	...	...	...	↓	...	...	...	↓	...	...	...	...	↓	...	...	...	...	...	...	...	↓
Londres ... ... arr.	...	...	...	...	...	...	...	21. 0	...	...	...	21.25	...	...	...	...	21.40	...	...	...	...	...	...	...	22.30

M.—Main Line Platforms, Nos. 1–4. **O.S.**—Outer Suburban Platforms, Nos. 5–8.

8. FRENCH SECTION DOWN TRAINS—*continued.*

Train No. ... ... / Platform		8	55 OS	54 OS	4 M	69	42 M	48	50 OS	52 OS	51 OS	5 M
Paris	... dép.	...	19.45	20.15	20.30	...	20.45	...	20.45	21.15	21.45	22 0
Beaumont-Persan ...	arr.	...	20. 5	20.35		...	↓	...	21. 5	21.35	22. 5	
	dép.	...	20. 8	20.37	↓	...		...	21. 8	21.37	22. 8	↓
Chambly-Fresnoy	... ,,	...	↓	20.43		...		...	↓	21.43	↓	
Dieudonne ...	... ,,	...		20.50		...		...		21.50		
Cauvigny ...	... ,,	...		20.59		...		...		21.59		
Hermes ...	... ,,	...		21. 7		...		...		22. 7		
Bresles ...	... ,,	...		21.15		...		...		22.15		
Fay-St-Quentin	... ,,	...		21.19		...		...		22.19		
Montreuil-sur-Brêche	arr.	...	20.33	21.28		...		...	21.33	22.28	22.33	
	dép.	...	20.35	...		...		...	21.35	22.30	22.35	
Breteuil ...	... ,,	...	20.48	...		...		...	21.48	↓	22.48	
La Faloise ...	... ,,	...	20.57	...		...		...	21.57		22.57	
Ailly-sur-Noye	... ,,	...	21. 5	...		...		...	22. 5		23. 5	
Sains	... ,,	...	21.12	...		...		...	22.12		23.12	
Amiens ...	arr.	...	21.20	...		...	21.31	...	22.20	22.55	23.20	
	dép.	...	...	...		...	21.35	21.40	...	...	23.35	
Vignacourt ...	... ,,	...	...	...		...	↓	21.56	...	...	23.51	
Domart ...	... ,,	...	...	...		...		22. 4	...	...	...	
St-Riquier ...	... ,,	...	...	...		...		22.14	...	...	...	
Crecy	... ,,	...	...	...		...		22.27	...	...	...	
Argoules ...	... ,,	...	...	...		...		22.37	...	...	...	
Montreuil-sur-Mer	... ,,	...	...	...		21.30		22.50	...	...	...	
Frencq ...	... ,,	...	...	...		21.41		23. 1	...	...	...	
Nesles ...	... ,,	...	...	...		21.51		23.11	...	...	...	
Pont-de-Briques	... ,,	...	...	...		21.59		23.19	...	...	...	
Boulogne ...	arr.	...	...	...		22. 5	22.20	23.25	...	...	...	
	dép.	21.20	...	...		22. 8	22.25	23.30	...	...	...	
Wimereux ...	... ,,	↓	...	...		22.14	22.31	23.36	...	...	...	
Ambleteuse ...	... ,,		...	...		22.19	22.37	23.42	...	...	...	
Wissant-Marquise	... arr.		...	...		22.25	22.45	23.50	...	...	...	
Ashford ...	... arr.		...	...		...	...	...	...	...	...	
Londres ...	... arr.	22.45	...	...	23.15	...	...	...	...	...	...	0.45

Train No. ... ... / Platform		9	68	59 OS	40 M	69	67 OS	56 OS	54 OS	6 M	69	47	47	55 OS	55 OS
Paris	... dép.	...	...	22.15	22.40	...	22.45	23.15	23.45	0. 0	...	...	...	0.15	0.15
Beaumont-Persan ...	arr.	...	...	22.35	↓	...	23. 5	23.35	0. 5	↓	...	...	...	0.35	0.35
	dép.	...	...	22.37		...	23. 8	23.37	0. 7		...	...	...	0.38	0.37
Chambly-Fresnoy	... ,,	...	...	22.43		...	↓	23.43	0.13		...	...	...	↓	0.43
Dieudonne ...	... ,,	...	...	22.50		...		23.50	0.20		...	...	...		0.50
Cauvigny ...	... ,,	...	...	22.59		...		23.59	0.29		...	...	Les mercredis seulement		0.59
Hermes ...	... ,,	...	...	23. 7		...		0. 7	0.37		...	Les samedis seulement			1. 7
Bresles ...	... ,,	...	...	23.15		...		0.15	0.45		...				1.15
Fay-St-Quentin	... ,,	...	...	23.19		...		0.19	0.49		...				1.19
Montreuil-sur-Brêche	arr.	...	...	23.28		...	23.33	0.28	0.58		...			1. 3	1.28
	dép.	...	...	23.30		...	23.35	0.30	1. 0		...			1. 5	1.30
Breteuil ...	... ,,	...	...	23.43		...	23.48	0.43	1.13		...			1.18	1.45
La Faloise ...	... ,,	...	...	...		...	23.57	...	...		...			1.27	...
Ailly-sur-Noye	... ,,	...	...	...		...	0. 5	...	...		...			1.35	...
Sains	... ,,	...	...	...		...	0.12	...	...	slip	...			1.42	...
Amiens ...	arr.	...	...	...	23.26	...	0.20	...	...	0.50	...			1.50	...
	dép.	...	...	...	23.30	...	...	...	...	↓	...	1. 0	1. 0	Les lundis, mercredis, vendredis, seulement	...
Vignacourt ...	... ,,	...	...	...	↓	...	...	...	...		...	...	1.16		...
Domart ...	... ,,	...	...	...		...	...	...	...		...	...	1.24		Les mardis, jeudis, samedis, seulement
St-Riquier ...	... ,,	...	...	...		...	...	...	...		...	1.22	1 34		
Crecy	... ,,	...	...	...		...	...	...	...		...	...	1.47		
Argoules ...	... ,,	...	...	...		...	...	...	...		...	...	1.57		
Montreuil-sur-Mer	... ,,	...	23. 5	...		...	...	...	...		...	1.45	2.10		
Frencq ...	... ,,	...	23.16	...		...	...	...	...		...	1 55	2.21		
Nesles ...	... ,,	...	23.26	...		0.30	...	...	...		...	...	2.31		
Pont-de-Briques	... ,,	...	23.34	...		0.38	...	...	...	slip	...	...	2.39		
Boulogne ...	arr.	...	23.40	...	0.15	0.44	...	...	...	1.25	...	2.10	2.45		
	dép.	23.40	23.43	...	0.20	...	...	...	...	↓	1.30	Samedi seulement	Mercredi seulement		
Wimereux ...	... ,,	↓	23.49	...	0.26	...	...	...	...		1.36				
Ambleteuse ...	... ,,		23.54	...	0.32	...	...	...	...		1.41				
Wissant-Marquise	... arr.		0. 0	...	0.40	...	...	...	...		1.47				
Ashford ...	... arr.		...	...	...	...	...	...	...		...				
Londres ...	... arr.	1. 5	...	...	...	...	...	...	...	2.45	...				

M.—Main Line Platforms, Nos. 1–4 **O.S.**—Outer Suburban Platforms, Nos. 5–8.

9. MONTREUIL-SUR-MER, BOULOGNE, ET WISSANT-MARQUISE

TRAIN No.					10	70		71	49	68			70	44	45			71	46	68		69	38	47	70
Paris ... ... *dép.*	...	...	...	...	5.15	...	...	...	5.15	...	...	...	...	7.10	8. 0	...	...	...	8.45	...	...	...	10. 0	8.45	...
Montreuil-sur-Mer ... ,,	...	...	...	...	...	6.10	...	6.40	7.40	7.55	...	...	...	8.45		...	...	9.15	...	...	...	...		10.50	11. 0
Frencq ... ... ,,	...	...	...	...	...	6.21	...	6.51	7.51	8. 6	...	...	...	8.55		...	...	9.26	...	...	...	...		11. 1	11.11
Nesles ... ... ,,	...	...	...	...	...	6.31	...	7. 1	8. 1	8.16	...	...	8.46	...		...	...	9.36	...	10.46	...	10.56		11.11	11.21
Pont-de-Briques ... ,,	...	...	...	...	slip	6.39	...	7. 9	8. 9	8.24	...	...	8.54	...		...	...	9.44	...	10.54	...	11. 4		11.19	11.29
Boulogne ... ... *arr.*	...	...	...	...	6.40	6.45	...	7.15	8.15	8.30	...	...	9. 0	9.10	9.20	...	...	9.50	10.20	11. 0	...	11.10	11.20	11.25	11.35
Boulogne ... ... *dép.*	...	...	...	...	...	...	...	7.30	8.35	8.45	...	...	...	9.30	...	...	...	...	...	...	...	...	...	11.40	11.50
Ashford ... ... *arr.*	...	...	...	...	...	...	...	...	...	9.40	...	...	...	...	...	...	...	...	...	...	...	...	...	12.35	...
Londres ... ... *arr.*	...	...	...	...	...	...	...	8.55	10. 0	...	...	...	...	10.55	...	...	...	...	...	...	...	...	...	...	13.15
Londres ... ... *dép.*	...	...	...	...	...	5.15	...	...	6.35	...	...	...	...	...	...	...	...	8.10	...	9.25	...	...	...	...	...
Ashford ... ... *dép.*	...	...	...	...	...	slip	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10. 5	...	...	...
Boulogne ... ... *arr.*	...	...	...	...	...	6.40	...	...	8. 0	...	...	...	...	...	...	...	...	9.35	...	10.50	...	11. 0	...	...	...
Boulogne ... ... *dép.*	...	...	...	...	...	6.48	...	7.18	8.20	8.33	...	...	9. 3	9.15	9.25	...	...	9.53	10.25	11. 3	...	11.13	11.25	11.30	11.38
Wimereux ... ... *arr.*	...	...	...	...	...	6.54	...	7.24	8.26	8.39	...	...	9. 9	9.21	9.31	...	...	9.59	10.31	...	...	11.19	11.31	11.36	11.44
Ambleteuse ... ... ,,	...	...	...	...	...	6.59	...	7.29	8.32	8.44	...	...	9.14	9.27	9.37	...	...	10. 4	10.37	...	...	11.24	11.37	11.42	11.49
Wissant-Marquise ... ,,	...	...	...	...	...	7. 5	...	7.35	8.40	8.50	...	...	9.20	9.35	9.45	...	...	10.10	10.45	11.15	...	11.30	11.45	11.50	11.55

10. WISSANT-MARQUISE, BOULOGNE, ET MONTREUIL-SUR-MER

TRAIN No.	38	39	47	68	40	70	41	71	7	68	42	43	70			69	49	71	44	68	45	69			70
Wissant-Marquise ... *dép.*	5. 5	6.20	6.35	7. 0	7. 5	7.35	7.45	8. 5	...	9. 0	9. 5	9.25	9.35	...	...	10. 0	10.40	10.55	11. 5	11.25	11.50	12. 0	...	...	12.15
Ambleteuse ... ... ,,	5.13	6.28	6.43	7. 6	7.13	7.41	7.53	8.11	...	9. 6	9.13	9.33	9.41	...	...	10. 6	10.48	11. 1	11.13	11.31	11.58	12. 6	...	...	12.21
Wimereux ... ... ,,	5.19	6.34	6.49	7.11	7.19	7.46	7.59	8.16	...	9.11	9.19	9.39	9.46	...	...	10.11	10.54	11. 6	11.19	11.36	12. 4	12.11	...	...	12.26
Boulogne ... ... *arr.*	5.25	6.40	6.55	7.17	7.25	7.52	8. 5	8.22	...	9.17	9.25	9.45	9.52	...	...	10.17	11. 0	11.12	11.25	11.42	12.10	12.17	...	...	12.32
Boulogne ... ... *dép.*	...	...	...	7.30	...	...	...	8.35	8.45	9.30	...	...	...	...	...	...	...	...	11.40	11.50	...	...	...	...	...
Ashford ... ... *arr.*	...	...	...	...	...	...	...	...	9.40	...	...	...	...	...	...	...	...	...	12.35	...	...	...	...	...	...
Londres ... ... *arr.*	...	...	...	8.55	...	...	...	10. 0	...	10.55	...	...	...	...	...	...	...	...	...	13.15	...	...	...	...	...
Londres ... ... *dép.*	...	5.15	...	...	...	...	6.35	...	...	...	...	8.10	...	...	...	...	9.25	...	...	...	10.30	...	...	...	...
Ashford ... ... *dép.*	...	slip	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10. 5	...	...	...	...	...	...	...
Boulogne ... ... *arr.*	...	6.40	...	...	...	...	8. 0	...	...	...	...	9.35	...	...	...	...	10.50	11. 0	...	...	11.55	...	...	...	...
Boulogne ... ... *dép.*	5.30	6.45	7. 0	7.20	7.30	7.55	8.10	8.25	...	9.20	9.30	9.50	9.55	...	...	10.20	11. 5	11 15	11.30	11.45	12.15	12.20	...	...	12.35
Pont-de-Briques ... *arr.*	5.36	...	7. 6	...		8. 1	...	8.31	...	9.26		...	10. 1	...	...	10.26	11.11	11.21		11.51	...	12.26	...	...	12.41
Nesles ... ... ,,	5.44	...	7.14	...		8. 9	...	8.39	...	9.34		...	10. 9	...	...	10.34	11.19	11.29		11.59	...	12.34	...	...	12.49
Frencq ... ... ,,	5.54	6.59	7.24	...		...	...	8.49	...	...		10. 5	10.19	...	...	...	11.29	11.39		12. 9	...	12.44	...	...	12.59
Montreuil-sur-Mer ... ,,	6. 5	7. 9	7.35	7.41		...	...	9. 0	...	...		10.15	10.30	...	...	...	11.40	...		12.20	...	12.55	...	...	13.10
Paris ... ... ,,	8.30	8.40	9.45	...	8.50	...	9.45	...	...	...	10.50	12. 0	...	...	...	...	13.50	...	12.50	...	13.50	...	...	...	...

9. MONTREUIL-SUR-MER, BOULOGNE, ET WISSANT-MARQUISE—*continued.*

Train No.	71		39		68	41	69	70		42		71	68	70	43		49	69	71	68		44	70		45
Paris ... ... *dép.*	...	...	10.40	...	...	12. 0	...	...	...	12.45	...	...	...	...	14. 0	...	12.45	...	...	...	...	14.35	...	...	16.10
Montreuil-sur-Mer ... „	...	...	12.25	...	12.30	↓	13.10	13.25	...	...	...	14. 0	14.45	...	↓	...	14.55	15.15	...	...	...	16.20	16.35	...	↓
Frencq ... ... „	11.46	...	12.35	...	12.41		13.21	13.36	...	...	...	14.11	...	...		...	15. 6	15.26	...	...	...	16.30	16.46	...	
Nesles ... ... „	11.56	...	...	...	12.51		13.31	13.46	...	...	...	14.21	...	15. 5		...	15.16	15.36	15.53	16.21	...	...	...	...	
Pont-de-Briques ... „	12. 4	...	...	...	12.59		13.39	13.54	...	...	...	14.29	...	...		...	15.24	15.44	16. 1	16.29	...	...	...	...	
Boulogne ... ... *arr.*	12.10	...	12.50	...	13. 5	13.20	13.45	14. 0	...	14.20	...	14.35	15. 5	15.16	15.20	...	15.30	15.50	16. 7	16.35	...	16.45	17. 1	...	17.30
Boulogne ... ... *dép.*	...	...	...	...	13.20	...	...	...	...	14.40	...	14.55	...	...	...	...	...	16. 5	...	...	...	17. 0	...	...	17.40
Ashford ... ... *arr.*	...	...	...	...	...	...	...	...	...	15.35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18.35
Londres ... ... *arr.*	...	...	...	...	14.45	...	...	...	...	...	...	16.20	...	...	...	...	...	17.30	...	...	...	18.25	...	...	...
Londres ... ... *dép.*	10.30	...	...	...	...	...	12. 5	...	...	...	...	...	13.20	...	...	...	...	...	14.30	...	...	...	...	...	...
Ashford ... ... *dép.*	...	...	...	...	...	...	...	12.52	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16. 5
Boulogne ... ... *arr.*	11.55	...	...	...	...	...	13.30	13.47	...	...	...	...	14.45	...	...	...	...	...	15.55	...	...	...	...	...	17. 0
Boulogne ... ... *dép.*	12.13	...	12.55	...	13. 8	13.25	13.48	14. 3	...	14.25	...	14.38	15. 8	15.17	15.25	...	15.32	15.53	16.10	16.38	...	16.50	17. 3	...	17.35
Wimereux ... ... *arr.*	12.19	...	13. 1	...	13.14	13.31	13.54	...	...	14.31	...	14.44	15.14	15.23	15.31	...	15.38	...	16.16	16.44	...	16.56	...	...	17.41
Ambleteuse ... ... „	12.24	...	13. 7	...	13.19	13.37	13.59	...	...	14.37	...	14.49	15.19	15.28	15.37	...	15.44	...	16.21	16.49	...	17. 2	...	...	17.47
Wissant-Marquise ... „	12.30	...	13.15	...	13.25	13.45	14. 5	14.15	...	14.45	...	14.55	15.25	15.35	15.45	...	15.50	16. 5	16.27	16.55	...	17.10	17.15	...	17.55

10. WISSANT-MARQUISE, BOULOGNE, ET MONTREUIL-SUR-MER—*continued.*

Train No.	71	46	16	38	68		69	70	47		39	71	68	70		41	49	69	71	68	42		70	48	
Wissant-Marquise ... *dép.*	12.50	13. 5	...	13.30	13.45	...	14.10	14.25	14.40	...	15. 5	15.15	15.40	15.50	...	15.53	16. 0	16.10	16.33	17. 3	17. 6	...	17.25	17.40	...
Ambleteuse ... ... „	12.56	13.13	...	13.38	13.51	...	14.16	14.31	14.48	...	15.13	15.21	15.46	...	...	16. 0	16. 7	...	16.39	17. 9	17.13	...	17.31	17.48	...
Wimereux ... ... „	13. 1	13.19	...	13.44	13.56	...	14.21	14.36	14.54	...	15.19	15.26	15.51	...	...	16. 5	16.12	...	16.44	17.14	17.19	...	17.36	17.54	...
Boulogne ... ... *arr.*	13. 7	13.25	...	13.50	14. 2	...	14.27	14.42	15. 0	...	15.25	15.32	15.57	16. 2	...	16.11	16.18	16.22	16.50	17.20	17.25	...	17.42	18. 0	...
Boulogne ... ... *dép.*	13.20	...	...	...	...	...	14.40	14.55	...	...	...	...	16. 5	...	...	...	...	...	17. 0	...	17.40	...	17.55	...	...
Ashford ... ... *arr.*	...	...	...	...	...	...	15.35	...	...	...	...	...	...	...	...	...	...	...	...	...	18.35	...	...	...	...
Londres ... ... *arr.*	14.45	...	...	...	...	...	...	16.20	...	...	...	...	17.30	...	...	...	...	...	18.25	...	...	...	19.20	...	...
Londres ... ... *dép.*	...	...	12. 5	...	...	...	...	...	13.20	...	...	...	...	14.30	...	...	...	...	...	...	...	...	16.10	...	...
Ashford ... ... *dép.*	...	...	...	12.52	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	16. 5	...	...	...	...	...
Boulogne ... ... *arr.*	...	...	13.30	13.47	...	...	...	...	14.45	...	...	...	...	15.55	...	...	...	...	...	17. 0	...	...	17.35	...	...
Boulogne ... ... *dép.*	13.10	13.30	...	13.55	14. 5	...	14.30	14.45	15. 5	...	15.30	15.35	16. 0	16. 5	...	16.15	16.20	16.25	16.53	17.22	17.30	...	17.50	18. 5	...
Pont-de-Briques ... *arr.*	13.16	↓	...	...	14.11	...	14.36	14.51	15.11	...	↓	...	16. 6	...	...	...	16.26	16.31	16.59	17.28	↓	...	17.56	18.11	...
Nesles ... ... „	13.24		...	...	14.19	...	14.44	14.59	15.19	...		15.46	16.14	...	...	...	16.34	16.39	17. 7	17.36		...	18. 4	18.19	...
Frencq ... ... „	13.34		...	14.10	14.29	...	14.54	...	15.29	...		...	...	...	...	...	16.44	16.49	17.17	17.46		...	18.14	18.29	...
Montreuil-sur-Mer ... „	13.45		...	14.20	14.40	...	15. 5	...	15.40	...		...	...	16.25	...	...	16.55	17. 0	17.28	17.57		...	18.25	18.40	...
Paris ... ... „	...	14.50	...	16. 5	...	...	...	...	17.50	...	16.50	...	...	...	...	17.50	19.50	...	...	...	18.50	...	...	21. 0	...

9. MONTREUIL-SUR-MER, BOULOGNE, ET WISSANT-MARQUISE—*continued.*

Train No.		69	40	68		70	46	38	47	69	39	49	68	41		69	42	48	68	40	69	6	69	47	47
Paris ... ... *dép.*	...	...	17.10	...	...	...	17. 0	17.55	17. 0	...	18.45	17.55	...	19. 5	...	...	20.45	20.45	...	22.40	...	0. 0		0. 0	0. 0
Montreuil-sur-Mer ... ,,	...	17. 5	↓	18.10	...	18.30	18.35	...	19. 5	...	↓	20. 0	20.25	20.40	...	21.30	...	22.50	23. 5	...	...	...	...	1.45	2.10
Frencq ... ... ,,	...	17.16		18.21	...	18.41	18.46	...	19.16	...		...	20.36	20.51	...	21.41	...	23. 1	23.16	...	...	...	...	1.55	2.21
Nesles ... ... ,,	...	17.26		18.31	...	18.51	18.56	...	19.26	19.46		...	20.46	21. 1	...	21.51	...	23.11	23.26	...	0.30	...	...	...	2.31
Pont-de-Briques ... ,,	...	17.34		18.39	...	18.59	19. 4	...	19.34	19.54		...	20.54	21. 9	...	21.59	...	23.19	23.34	...	0.38	slip	...	...	2.39
Boulogne ... ... *arr.*	...	17.40	18.30	18.45	...	19. 5	19.10	19.30	19.40	20. 0	20. 5	20.20	21. 0	21.15	...	22. 5	22.20	23.25	23.40	0.15	0.44	1.25	...	2.10	2.45
Boulogne ... ... *dép.*	...	17.55	...	...	...	...	...	...	20. 0	...	...	...	21.20	...	...	...	...	23.40	...	...	...	...	...	samedis seulement	mercredis seulement
Ashford ... ... *arr.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
Londres ... ... *arr.*	...	19.20	...	...	...	...	...	...	21.25	...	...	...	22.45	...	...	...	...	1. 5	...	...	...	...	...		
Londres ... ... *dép.*	...	16.10	...	17.10	...	...	...	...	...	...	...	18.45	...	...	...	20.30	...	...	...	...	...	0. 0	...		
Ashford ... ... *dép.*	...	...	...	...	...	...	...	...	...	18.50	...	...	...	...	...	...	...	...	...	...	...	...	...		
Boulogne ... ... *arr.*	...	17.35	...	18.35	...	...	...	...	...	19.45	...	20.10	...	...	...	21.55	...	...	...	...	...	1.25	...		
Boulogne ... ... *dép.*	...	17.48	18.35	18.48	...	19. 6	19.15	19.35	19.45	20. 3	20.10	20.23	21. 3	21.20	...	22. 8	22.25	23.30	23.43	0.20	...	...	1.35		
Wimereux ... ... *arr.*	...	17.54	18.41	18.54	...	19.12	19.21	19.41	19.51	20. 9	20.16	20.29	21. 9	21.26	...	22.14	22.31	23.36	23.49	0.26	...	...	1.41		
Ambleteuse ... ... ,,	...	17.59	18.47	18.59	...	19.17	19.27	19.47	19.57	20.14	20.22	20.34	21.14	21.32	...	22.19	22.37	23.42	23.54	0.32	...	...	1.46		
Wissant-Marquise ... ,,	...	18. 5	18.55	19. 5	...	19.23	19.35	19.55	20. 5	20.20	20.30	20.40	21.20	21.40	...	22.25	22.45	23.50	0. 0	0.40	...	...	1.52		

10. WISSANT-MARQUISE, BOULOGNE, ET MONTREUIL-SUR-MER—*continued.*

Train No.	44	69		68	40	70			45	69		49	68	46	47	69	16								
Wissant-Marquise ... *dép.*	18.25	18.40	...	19.25	19.35	19.50	...	...	20. 5	20.30	...	20.50	21.45	21.50	22.40	23.10	...	...	...	...	...	...	...	...	...
Ambleteuse ... ... ,,	18.33	18.46	...	19.31	19.43	19.56	...	...	20.13	...	...	20.58	21.51	21.58	22.48	23.16	...	...	...	...	...	...	...	...	...
Wimereux ... ... ,,	18.39	18.51	...	19.36	19.49	20. 1	...	...	20.19	...	...	21. 4	21.56	22. 4	22.54	23.21	...	...	...	...	...	...	...	...	...
Boulogne ... ... *arr.*	18.45	18.57	...	19.42	19.55	20. 7	...	...	20.25	20.42	...	21.10	22. 2	22.10	23. 0	23.27	...	...	...	...	...	...	...	...	...
Boulogne ... ... *dép.*	...	...	...	20. 0	...	...	...	...	...	...	...	21.20	...	...	mercredis et samedis	23.40	...	...	...	...	...	...	...	...	...
Ashford ... ... *arr.*	...	...	...	...	...	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...
Londres ... ... *arr.*	...	...	...	21.25	...	...	...	...	...	...	...	22.45	...	...		1. 5	...	...	...	...	...	...	...	...	...
Londres ... ... *dép.*	17.10	...	...	...	...	...	...	...	18.45	...	...	...	20.30	...		...	0. 0	...	...	...	...	...	...	...	...
Ashford ... ... *dép.*	...	...	...	...	18.50	...	...	...	...	...	...	...	...	...		...	...	...	...	...	...	...	...	...	...
Boulogne ... ... *arr.*	18.35	...	...	...	19.45	...	...	...	20.10	...	...	...	21.55	...		...	1.25	...	...	...	...	...	...	...	...
Boulogne ... ... *dép.*	18.50	19. 0	...	19.45	20. 0	20.10	...	...	20.30	20.45	...	21.15	22. 5	22.15	23. 5	23.30	...	...	...	...	...	...	...	...	...
Pont-de-Briques ... *arr.*	...	19. 6	...	19.51	↓	20.16	...	...	...	20.51	...	...	22.11	...	...	23.36	...	...	...	...	...	...	...	...	...
Nesles ... ... ,,	...	19.14	...	19.59		20.24	...	...	...	20.59	...	...	22.19	...	...	23.44	...	...	...	...	...	...	...	...	...
Frencq ... ... ,,	19. 5	...	...	20. 9		20.34	...	...	20.45	21. 9	...	21.30	22.29	...	23.20	...	...	...	...	...	...	...	...	...	...
Montreuil-sur-Mer ... ,,	19.15	...	...	20.20		20.45	...	...	20.55	21.20	...	21.40	22.40	...	23.30	...	...	...	...	...	...	...	...	...	...
Paris ... ... ,,	21. 0	...	...	...	21.20	...	...	...	22.40	...	...	23.50	...	23.50	1.45	...	...	...	...	...	...	...	...	...	...

11. BEAUMONT-PERSAN, ECOUEN ET PARIS

Up Trains Train No.				81	90		80	53	77	89		90	81	72	50	73	74	75	76			77	78	79
Beaumont-Persan ... *dép.*	...	...	...	...	5.30	...	5.55	6.10	...	6.20	...	...	6.55	...	7.10	...	...	...	...	...	...	...	...	...
Courcelles ... ... „	...	...	...	...	5.35	...	6. 0		...	6.25	...	...	7. 0	...		...	...	...	...	...	...	...	...	...
Maffliers ... ... „	...	...	...	...	5.40	...	6. 5		...	6.30	...	...	7. 5	...		...	...	...	...	...	...	...	...	7.26
Attainville ... ... „	...	...	...	...	5.44	...	6. 9		...	6.34	...	...	7. 9	...		...	...	...	...	...	...	...	7.26	
Ecouen ... ... „	...	...	...	5.18	5.48	...	6.13		6.18	6.39	...	6.48	7.13	...		...	...	...	...	...	...	7.26		
St-Brice ... ... „	...	...	...	5.21	5.51	...			6.21		...	6.51		...		...	...	...	7.26	...	...			
Sarcelles ... ... „	...	...	...	5.23	5.53	...			6.23		...	6.53		...		...	...	7.25		...	...			
Pierrefitte ... ... „	...	...	...	5.26	5.56	...			6.26		...	6.56		...		...	7.24	...		...	...			
Stains ... ... „	...	...	...	5.29	5.59	...			6.29		...	6.59		...		7.23	...	...		...	...			
St-Denis ... ... „	...	...	...	5.32	6. 2	...			6.32		...	7. 2		7.22		...	...	...		...	...			
Paris ... ... *arr.*	...	...	...	5.40	6.10	...	6.27	6.30	6.40	6.52	...	7.10	7 27	7.30	7.30	7.32	7.34	7.36	7.38	...	...	7.40	7.42	7.44
Platform				11	10		9	OS	12	11		10	9	12	OS	11	10	9	12			11	10	9

12. PARIS, ECOUEN ET BEAUMONT-PERSAN

Down Trains Train No. ... ... Platform	80 9	62 OS	89 12	81 11	90 10	63 OS	80 9		77 12	89 11	53 OS	90 10	81 9	72 12		73 11	74 10	75 9	76 12	50 OS	R M	77 11	78 10	79 9
Paris ... ... *dép.*	5. 0	5.30	5.30	6. 0	6.20	6.30	6.35	...	6.45	6.58	7.15	7.15	7.32	7.36	...	7.38	7.40	7.42	7.44	7.45	...	7.46	7.48	7.50
St-Denis ... ... *arr.*	5 8.		5.38	6. 8	6.28			...	6.53			7.23	7.40		...						...	...	...	...
Stains ... ... „	5.11		5.41	6.11	6.31			...	6.56			7.26	...		...						...	...	...	8. 0
Pierrefitte ... ... „	5.14		5.44	6.14	6.34			...	6.59			7.29	...		...						...	...	7.59	...
Sarcelles ... ... „	5.17		5.47	6.17	6.37			...	7. 2			7.32	...		...						...	7.58	...	...
St-Brice ... ... „	5.19		5.49	6.19	6.39			...	7. 4			7.34	...		...				7.57		...	...	...	...
Ecouen ... ... „	5.22		5.52	6.22	6.43		6.49	...	7. 8	7.12		7.37	...		...			7.57	...		7.59	...	...	...
Attainville ... ... „	5.26		5.56	6.26	...		6.53	...	...	7.16		7.41	...		...		7.57	...	...		8. 3	...	...	...
Maffliers ... ... „	5.30		6. 0	6.30	...		6.57	...	...	7.20		7.45	...		...	7.57	...	...	...		8. 7	...	...	...
Courcelles ... ... „	5.35		6. 5	6.35	...		7. 2	...	...	7.25		7.50	...	7.57	...	...	...	...	...		8.12	...	...	...
Beaumont-Persan ... „	5.40	5.50	6.10	6.40	...	6.50	7. 7	...	...	7.30	7.35	7.55	...	...	...	...	...	...	...	8. 5	8.17 (*a*)	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8. **R. M.**—Rail Motor. (*a*) Calls at Chambly 8.22, Dieudonne 8.28, and Cauvigny 8.35, connecting with 8.15 from Paris.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

UP TRAINS TRAIN NO.		80	RM	81	82	83	84	85	86	61	87	88	89	80	79	78	77	76	75	74	73		72	89	38
Beaumont-Persan	... *dép.*	7.21	7.25	...	...	...	...	...	...	7.40	...	...	7.41	...	...	...	...	...	...	...	...	...	...	...	8.12
Courcelles ...	... ,,	7.26	7.30	...	...	...	...	...	...		...	...	7.46	...	...	...	...	...	...	...	...	...	8. 6	...	
Maffliers ...	... ,,		7.35	...	...	...	...		...		...	7.46		...	...	...	...	...	...	...	8. 6	...		...	
Attainville ...	... ,,		7.39	...	...	...	...	...	...		7.46			...	...	...	...	...	...	8. 6		...		...	
Ecouen	... ,,		7.43	...	...	...	...	...	7.46					...	...	...	...	...	8. 6			...		...	
St-Brice ...	... ,,		...	...	...	...	...	7.46						...	...	...	...	8. 6				...		...	
Sarcelles ...	... ,,		...	...	...	...	7.45							...	...	...	8. 5					...		...	
Pierrefitte ...	... ,,		...	...	...	7.44	...							...	...	8. 4	...					...		...	
Stains	... ,,		...	...	7.43	...	...							...	8. 3	...	...					...		...	
St-Denis ...	... ,,		...	7.42	...	...	...							8. 2	...	...	...					...		8.22	
Paris	... *arr.*	7.46	...	7.50	7.52	7.54	7.56	7.58	8. 0	8. 0	8. 2	8. 4	8. 6	8.10	8.12	8.14	8.16	8.18	8.20	8.22	8.24	...	8.26	8.30	8.30
PLATFORM		12		10	9	12	11	10	9	OS	12	11	10	12	11	10	9	12	11	10	9		12	10	OS

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

DOWN TRAINS TRAIN NO.		80		81	82	83	84	85	86	61	87	88	89	80	79	78	77	76	75	74	73	RM	72	89	
PLATFORM		12		10	9	12	11	10	9	OS	12	11	10	12	11	10	9	12	11	10	9		12	10	
Paris	... *dép.*	7.52	...	7.56	7.58	8. 0	8. 2	8. 4	8. 6	8. 8	8. 8	8.10	8.12	8.16	8.18	8.20	8.22	8.24	8.26	8.28	8.30	...	8.32	8.36	...
St-Denis ...	... *arr.*	8. 0	...						...		...	...	8.20						...	...	...	...	8.40		...
Stains	... ,,	...	...						...		...	8.20	...						...	...	8.40	...	...		...
Pierrefitte ...	... ,,	...	...						...		8.19	...	...						...	8.39	...	...	...		...
Sarcelles ...	... ,,	...	...						8.18		...	...	...						8.38	...	...	...	...		...
St-Brice ...	... ,,	...	...					8.17	...		...	...	...					8.37	...	...	...	...	...		...
Ecouen	... ,,	...	...				8.17	...	...		...	...	...				8.37	...	...	...	...	8.45	...		...
Attainville ...	... ,,	...	...			8.17	...	...	...		...	...	...			8.37	...	...	...	...	...	...	...		...
Maffliers ...	... ,,	...	...		8.17	...	...	...	...		...	...	...		8.37	...	...	...	...	...	...	8.52	...		...
Courcelles ...	... ,,	...	...	8.17	...	...	...	...	...		...	...	...	8.37	...	...	...	...	...	...	...	...	...	8.57	...
Beaumont-Persan	... ,,	...	...	...	...	...	...	...	...	8.28	...	...	...	...	...	...	...	...	...	...	...	8.59	...	...	...

O.S.—Outer Suburban Platforms, Nos 5–8. **R.M.**—Rail Motor.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No.	88	87	86	85	84	83		82	81	R M	72	73	74	75	76	77	61	78	79	80		81	82	83
Beaumont-Persan ... *dép.*	...	...	...	...	...	...	...	...	...	8.23	...	...	...	...	...	...	8.40	...	...	...	...	...	...	...
Courcelles ... ... „	...	...	...	...	...	...	...	...	8.26	8.28	...	...	...	...	...	...		...	...	8.46	...	...	...	...
Maffliers ... ... „	...	...	...	...	...	...	...	8.26		8.33	...	...	...	...	...	...		...	8.46		...	...	...	...
Attainville ... ... „	...	...	...	...	...	8.26	...			8.37	...	...	...	...	...	...		8.46			...	...	...	...
Ecouen ... ... „	...	...	...	...	8.26		...			8.41	...	...	...	...	...	8.46					...	...	...	...
St-Brice ... ... „	...	...	...	8.26			...			...	...	...	...	...	8.46						...	...	...	...
Sarcelles ... ... „	...	...	8.25				...			...	...	...	...	8.45							...	...	...	...
Pierrefitte ... ... „	...	8.24	...				...			...	...	...	8.44	...							...	...	...	9. 4
Stains ... ... „	8.23	...	...				...			...	...	8.43	...	...							...	...	9. 3	...
St-Denis ... ... „	...	...	...				...			...	8.42	...	...	...							...	9. 2	...	...
Paris ... ... *arr.*	8.32	8.34	8.36	8.38	8.40	8.42	...	8.44	8.46	...	8.50	8.52	8.54	8.56	8.58	9. 0	9. 0	9. 2	9. 4	9. 6	...	9.10	9.12	9.14
Platform	9	12	11	10	9	12		11	10		12	11	10	9	12	11	OS	10	9	12		10	9	12

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform	88 9	87 12	86 11	85 10	84 9	83 12	65 OS	82 11	81 10		72 12	73 11	74 10	75 9	76 12	77 11		78 10	79 9	80 12	51 OS	81 10	82 9	83 12
Paris ... ... *dép.*	8.38	8.40	8.42	8.44	8.46	8.48	8.49	8.50	8.52	...	8.56	8.58	9. 0	9. 2	9. 4	9. 6	...	9. 8	9.10	9.12	9.15	9.16	9.18	9.20
St-Denis ... ... *arr.*					...	...		...	9. 0	...						...	...	...	...	9.20				
Stains ... ... „					...	...		9. 0	...	...						...	...	...	9.20	...				
Pierrefitte ... ... „					...	8.59		...	...	...						...	...	9.19	...	...				
Sarcelles ... ... „					8.58	...		...	...	...						9.18	...	...	...	...				
St-Brice ... ... „				8.57	...	...		...	...	...					9.17	...	...	...	...	...				
Ecouen ... ... „			8.57	...	...	...		...	...	...				9.17	...	...	...	...	...	...				
Attainville ... ... „		8.57	...	...	...	...		...	...	...			9.17	...	...	...	...	...	...	...				9.37
Maffliers ... ... „	8.57	...	...	...	...	...		...	...	...		9.17	...	...	...	...	...	...	...	...			9.37	...
Courcelles ... ... „	...	...	...	...	...	...		...	...	...	9.17	...	...	...	...	...	...	...	...	...		9.37	...	...
Beaumont-Persan ... „	...	...	...	...	...	...	9. 8	...	...	...	...	...	...	...	...	...	...	...	...	...	9.35	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

R.M.—Rail Motor.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains Train No.	84	85	86	87	88	89	80		79	78	60	77	76		75	74	73	72	89	88	87	86	85	84
Beaumont-Persan ... *dép.*	...	...	...	...	...	...	...	...	...	...	9.15	...	...	...	...	...	...	...	...	...	...	...	...	...
Courcelles ... ... ,,	...	...	...	...	...	9. 6	...	...	...	...	↓	...	...	...	...	...	...	9.26	...	...	...	...	...	...
Maffliers ... ... ,,	...	...	...	...	9. 6	↓	...	...	...	...	↓	...	...	...	...	...	9.26	↓	...	...	...	...	...	...
Attainville ... ... ,,	...	...	...	9. 6	↓	↓	...	...	...	...	↓	...	...	...	...	9.26	↓	↓	...	...	...	...	...	...
Ecouen ... ... ,,	...	...	9 6	↓	↓	↓	...	...	...	...	↓	...	...	...	9.26	↓	↓	↓	...	...	...	...	...	9.46
St-Brice ... ... ,,	...	9. 6	↓	↓	↓	↓	...	...	...	...	↓	...	9.26	...	↓	↓	↓	↓	...	...	...	...	9.46	↓
Sarcelles ... ... ,,	9. 5	↓	↓	↓	↓	↓	...	...	...	...	↓	9.25	↓	...	↓	↓	↓	↓	...	...	...	9.45	↓	↓
Pierrefitte ... ... ,,	...	↓	↓	↓	↓	↓	...	...	...	9.24	↓	...	↓	...	↓	↓	↓	↓	...	...	9.44	...	↓	↓
Stains ... ... ,,	...	↓	↓	↓	↓	↓	...	...	9.23	...	↓	...	↓	...	↓	↓	↓	↓	...	9.43	...	...	↓	↓
St-Denis ... ... ,,	...	↓	↓	↓	↓	↓	9.22	...	...	...	↓	...	↓	...	↓	↓	↓	↓	9.42	...	...	...	↓	↓
Paris ... ... *arr.*	9.16	9.18	9.20	9.22	9.24	9.26	9.30	...	9.32	9.34	9.35	9.36	9.38	...	9.40	9.42	9.44	9.46	9.50	9.52	9.54	9.56	9.58	10. 0
Platform	11	10	9	12	11	10	12		11	10	OS	9	12		11	10	9	12	10	9	12	11	10	9

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains Train No. ... ... Platform	84 11	85 10	86 9	87 12	88 11	89 10	80 12	62 OS	79 11	78 10		77 9	76 12	60 OS	75 11	74 10	73 9	72 12	89 10	88 9	87 12	86 11		
Paris ... ... *dép.*	9.22	9.24	9.26	9.28	9.30	9.32	9.36	9.38	9.38	9.40	...	9.42	9.44	9.45	9.46	9.48	9.50	9.52	9.56	9.58	10. 0	10. 2	...	...
St-Denis ... ... *arr.*	↓	↓	...	...	...	9.40	↓	↓	↓	↓	...	↓	↓	↓	...	...	...	10. 0	10. 4	↓	↓	...	...	...
Stains ... ... ,,	↓	↓	...	...	9.40	...	↓	↓	↓	↓	...	↓	↓	↓	...	...	...	10. 3	...	↓	↓	10.11	...	...
Pierrefitte ... ... ,,	↓	↓	...	9.39	...	...	↓	↓	↓	↓	...	↓	↓	↓	...	9.59	10. 0	...	...	↓	↓	...	...	...
Sarcelles ... ... ,,	↓	↓	9.38	...	...	...	↓	↓	↓	↓	...	↓	↓	↓	9.58	...	10. 3	...	...	↓	↓	...	...	...
St-Brice ... ... ,,	↓	9.37	...	...	...	...	↓	↓	↓	↓	...	↓	9.57	↓	...	...	10. 5	...	...	↓	↓	...	...	...
Ecouen ... ... ,,	9.37	...	...	...	...	...	↓	↓	↓	↓	...	9.57	...	↓	...	...	10. 9	...	...	↓	↓	10.18	...	...
Attainville ... ... ,,	...	...	...	...	...	...	↓	↓	↓	9.57	...	...	...	↓	...	...	...	...	...	↓	10.17	...	...	...
Maffliers ... ... ,,	...	...	...	...	...	...	↓	↓	9.57	...	...	...	...	↓	...	...	...	...	...	10.17	...	...	...	...
Courcelles ... ... ,,	...	...	...	...	...	...	9.57	↓	...	...	...	...	...	↓	...	...	...	...	...	10.22	...	...	...	...
Beaumont-Persan ... ,,	...	...	...	...	...	...	10. 2	9.58	...	...	...	...	...	10. 5	...	...	...	...	...	10.27	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No:		83	82	61		81			77		80	62	63	73		86	64	83		82	50			77
Beaumont-Persan ... dép	...	...	...	9 45	...	...	...	...	...	...	10. 7	10.10	10.30	...	...	10.35	11. 0	...	...	11. 5	11.30	...	...	...
Courcelles ... ... ,,	...	...	...		...	9.46	...	...	...	...	10.12			...	...	10.40		...	...	11.10		...	...	...
Maffliers ... ... ,,	...	...	9.46		...		...	...	...	...	10.16			...	...	10.45		...	...	11.15		...	...	...
Attainville ... ... ,,	...	9.46			...		...	...	...	...	10.20			...	...	10.49		...	...	11.19		...	...	...
Ecouen ... ... ,,	...				...		...	...	10. 0	...	10.24			10.30	...	10.53		11. 0	...	11.23		...	...	11.30
St-Brice ... ... ,,	...				...		...	...	10. 3	...				10.33	...			11. 3	...			...	...	11.33
Sarcelles ... ... ,,	...				...		...	...	10 5	...				10.35	...			11. 5	...			...	...	11.35
Pierrefitte ... ... ,,	...				...		...	...	10. 8	...				10.38	...			11. 8	...			...	...	11.38
Stains ... ... ,,	...				...		...	...	10.11	...				10.41	...			11.11	...			...	...	11.41
St-Denis ... ... ,,	...				...		...	...	10.14	...				10.44	...			11.14	...			...	...	11.44
Paris ... ... arr.	...	10. 2	10. 4	10. 5	...	10. 6	...	...	10.22	...	10.38	10.30	10.50	10.52	...	11. 7	11.20	11.22	...	11.37	11.50	...	...	11.52
Platform		12	11	OS		10			9		12	OS	OS	11		10	OS	9		12	OS			11

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform	59 OS	83 12	82 11		53 OS	81 10	72	39 OS	77 9	52 OS	80 12			73 11	63 OS	86 10		83 9	64 OS	82 12		85 12	84 9	77 11
Paris ... ... dép.	10. 8	10. 8	10.10	...	10.15	10.25	...	10.40	10.40	10.45	10.55	...	...	11.10	11.15	11.25	...	11.40	11.45	11.55	...	12. 5	12. 8	12.10
St-Denis ... ... arr.		...	10.18	...			...		10.48			...	...	11.18			...	11.48			...			12.18
Stains ... ... ,,		...	10.21	...			10.40		10.51			...	...	11.21			...	11.51			...			12.21
Pierrefitte ... ... ,,		10.19	10.24	...			10.43		10.54			...	...	11.24			...	11.54			...			12.24
Sarcelles ... ... ,,		...	10.27	...			10.46		10.57			...	...	11.27			...	11.57			...			12.27
St-Brice ... ... ,,		...	10.29	...			..		10.59			...	...	11.29			...	11.59			...		12.20	12.29
Ecouen ... ... ,,		10.26	10.32	...		10.39	...		11. 3		11. 9	...	...	11.33		11.39	...	12. 3		12. 9	...		12.23	12.33
Attainville ... ... ,,		...	10.36	...		10.43	...		...		11.13	...	...	...		11.43	...	...		12.13	...		12.27	...
Maffliers ... ... ,,		...	10.40	...		10.47	...		...		11.17	...	...	...		11.47	...	...		12.17	...	12.23	...	...
Courcelles ... ... ,,		...	10.45	...		10.52	...		...		11.22	...	...	...		11.52	...	...		12.22	...	12.28	...	...
Beaumont-Persan ... ,,	10.28	...	10.50	...	10.35	10.57	...	10.58	...	11. 5	11.27	...	...	...	11.35	11.57	...	...	12. 5	12.27	...	12.33	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No.		81	43	73		80	51	86	65		83	82	53		77	85	84	60	73		81	63		86
Beaumont-Persan ... *dép.*	...	11.35	11.42	...	...	11.50	12. 0	12. 5	12.30	...	...	12.35	13. 0	...	...	13. 5	...	13.30	...	...	13.35	14. 0	...	...
Courcelles ... ... ,,	...	11.40		...	...	11.55		12.10		...	...	12.40		...	...	13.10	...		...	...	13.40		...	...
Maffliers ... ... ,,	...	11.45		...	...	12. 0		12.15		...	...	12.45		...	...	13.15	...		...	...	13.45		...	...
Attainville ... ... ,,	...	11.49		...	...	12. 4		12.19		...	...	12.49		...	...	13.19	13.22		...	...	13.49		...	...
Ecouen ... ... ,,	...	11.53		12. 0	...	12. 8		12.23		...	12.30	12.53		...	13. 0	13.23	13.26		13.30	...	13.53		...	14. 0
St-Brice ... ... ,,	...			12. 3	...	12.11				...	12.33			...	13. 3		13.29		13.33	...			...	14. 3
Sarcelles ... ... ,,	...			12. 5	...	12.13				...	12.35			...	13. 5		13.31		13.35	...			...	14. 5
Pierrefitte ... ... ,,	...			12. 8	...	12.16				...	12.38			...	13. 8		13.34		13.38	...			...	14. 8
Stains ... ... ,,	...			12.11	...	12.19				...	12.41			...	13.11		...		13.41	...			...	14.11
St-Denis ... ... ,,	...			12.14	...	12.22				...	12.44			...	13.14		...		13.44	...			...	14.14
Paris ... ... *arr.*	...	12. 7	12. 0	12.22	...	12.30	12.20	12.37	12.50	...	12.52	13. 7	13.20	...	13.22	13.37	13.44	13.50	13.52	...	14. 7	14.20	...	14.22
Platform		10	OS	9		12	OS	11	OS		10	9	OS		12	11	9	OS	10		9	OS		12

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform	50 OS	81 10		73 9	51 OS	80 12		86 11		65 OS	83 10	82 9		53 OS	77 12	85 11			73 10	62 OS	81 9		44 OS	86 12
Paris ... ... *dép.*	12.15	12.25	...	12.40	12.45	12.55	...	13.10	...	13.15	13.25	13.40	...	13.45	13.55	14. 0	...	...	14.10	14.15	14.25	...	14.35	14.40
St-Denis ... ... *arr.*			...	12.48			...	13.18	...			13.48	...			14. 8	...	...	14.18			...		14.48
Stains ... ... ,,			...	12.51			...	13.21	...			13.51	...			14.11	...	...	14.21			...		14.51
Pierrefitte ... ... ,,			...	12.54			...	13.24	...			13.54	...			14.14	...	...	14.24			...		14.54
Sarcelles ... ... ,,			...	12.57			...	13.27	...			13.57	...			14.17	...	...	14.27			...		14.57
St-Brice ... ... ,,			...	12.59			...	13.29	...			13.59	...			14.19	...	...	14.29			...		14.59
Ecouen ... ... ,,		12.39	...	13. 3		13 .9	...	13.33	...		13.39	14. 3	...		14. 9	14.22	...	...	14.33		14.39	...		15. 3
Attainville ... ... ,,		12.43	...	...		13.13	...	...	...		13.43	...	...		14.13	14.26	...	...	...		14.43	...		...
Maffliers ... ... ,,		12.47	...	...		13.17	...	...	...		13.47	...	...		14.17	14.30	...	...	...		14.47	...		...
Courcelles ... ... ,,		12.52	...	...		13.22	...	...	...		13.52	...	...		14.22	14.35	...	...	...		14.52	...		...
Beaumont-Persan ... ,,	12.35	12.57	...	...	13. 5	13.27	...	...	...	13.35	13.57	...	...	14. 5	14.27	14.40	...	...	...	14.35	14.57	...	14.53	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No.		80	52	82		83	50	73		77	64		86	81	38	82	85	65	80	59				74
Beaumont-Persan ... *dép.*	...	14. 5	14.30	...	...	14.35	15. 0	...	...	15. 5	15.30	...	...	15.35	15.47	...	15.50	16. 0	16. 5	16.20	...	...	...	...
Courcelles ... ... „	...	14.10	↓	...	...	14.40	↓	...	...	15.10	↓	...	...	15.40	↓	...	15.55	↓	16.10	↓	...	...	...	...
Maffliers ... ... „	...	14.15	↓	...	...	14 45	↓	...	...	15.15	↓	...	...	15.45	↓	...	16. 0	↓	16.15	↓	...	...	...	...
Attainville ... ... „	...	14.19	↓	...	...	14 49	↓	...	...	15.19	↓	...	...	15.49	↓	...	16. 4	↓	16.19	↓	...	...	...	...
Ecouen ... ... „	...	14.23	↓	14.30	...	14.53	↓	15. 0	...	15.23	↓	...	15.30	15.53	↓	16. 0	16. 8	↓	16.23	↓	...	...	...	...
St-Brice ... ... „	...	↓	↓	14.33	...	↓	↓	15. 3	...	↓	↓	...	15.33	↓	↓	16. 3	16.11	↓	↓	↓	...	...	...	...
Sarcelles ... ... „	...	↓	↓	14.35	...	↓	↓	15. 5	...	↓	↓	...	15.35	↓	↓	16. 5	16.13	↓	↓	↓	...	...	...	...
Pierrefitte ... ... „	...	↓	↓	14.38	...	↓	↓	15. 8	...	↓	↓	...	15.38	↓	↓	16. 8	16.16	↓	↓	↓	...	...	...	16.34
Stains ... ... „	...	↓	↓	14.41	...	↓	↓	15.11	...	↓	↓	...	15.41	↓	↓	16.11	16.19	↓	↓	↓	...	...	...	16.37
St-Denis ... ... „	...	↓	↓	14.44	...	↓	↓	15.14	...	↓	↓	...	15.44	↓	↓	16.14	16.22	↓	↓	↓	...	...	...	16.40
Paris ... ... *arr.*	...	14.37	14.50	14.52	...	15. 7	15.20	15.22	...	15.37	15.50	...	15.52	16. 7	16. 5	16.22	16.30	16.20	16.37	16.40	...	...	...	16.48
Platform		11	OS	10		9	OS	12		11	OS		10	9	OS	12	11	OS	10	OS				12

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform	63 OS	80 11		82 10	52 OS	83 9		73 12	50 OS	77 11		60 OS	86 10	81 9		82 12			80 10		61 OS	84 10	85 9	74 12
Paris ... ... *dép.*	14.45	14.55	...	15.10	15.15	15.25	...	15.40	15.45	15.55	...	16.10	16.10	16.25	...	16.40	...	...	16.43	...	16.50	16.50	16.52	16.54
St-Denis ... ... *arr.*	↓	↓	...	15.18	↓	↓	...	15.48	↓	↓	...	↓	16.18	↓	...	...	...	...	16.51	...	↓	↓	↓	↓
Stains ... ... „	↓	↓	...	15.21	↓	↓	...	15.51	↓	↓	...	↓	16.21	↓	...	...	...	...	16.54	...	↓	↓	↓	↓
Pierrefitte ... ... „	↓	↓	...	15.24	↓	↓	...	15.54	↓	↓	...	↓	16.24	↓	...	16.51	...	...	...	...	↓	↓	↓	↓
Sarcelles ... ... „	↓	↓	...	15.27	↓	↓	...	15.57	↓	↓	...	↓	16.27	↓	...	16.54	...	...	...	...	↓	↓	↓	↓
St-Brice ... ... „	↓	↓	...	15.29	↓	↓	...	15.59	↓	↓	...	↓	16.29	↓	...	16.56	...	...	...	...	↓	↓	↓	↓
Ecouen ... ... „	↓	15. 9	...	15.33	↓	15.39	...	16. 3	↓	16. 9	...	↓	16.33	16.39	...	17. 0	...	...	...	...	↓	↓	↓	↓
Attainville ... ... „	↓	15.13	...	...	↓	15 43	...	...	↓	16.13	...	↓	...	16.43	...	...	...	...	...	...	↓	↓	↓	17.11
Maffliers ... ... „	↓	15.17	...	...	↓	15.47	...	...	↓	16.17	...	↓	...	16.47	...	...	...	...	...	...	↓	↓	17.11	...
Courcelles ... ... „	↓	15.22	...	...	↓	15.52	...	...	↓	16.22	...	↓	...	16.52	...	...	...	...	...	...	↓	17.11	...	...
Beaumont-Persan ... „	15. 5	15.27	...	...	15.35	15.57	...	...	16. 5	16.27	...	16.30	...	16.57	...	...	...	...	...	...	17.10	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains Train No.		75	51	76	86	78	82	77	89	80	81	72	83	73	60	87	79	88	62	77	82	78	86	76	75
Beaumont-Persan	... *dép.*	...	16.30	...	...	...	...	16.35	...	...	16.42	...	16.46	...	16.50	...	...	16.55	17. 0	...	...	...	...	...	...
Courcelles ...	... „	...		...	...	...	...	16.40	...	...		...		...		...	...	17. 0		...	...	...	...	...	...
Maffliers ...	... „	...		...	...	...	16.40		...	...		...		...		...	17. 0			...	...	...	...	...	...
Attainville ...	... „	...		...	...	16.40			...	...		...		...		17. 0				...	...	...	...	...	...
Ecouen	... „	...		...	16.40				...	...		...		17. 0						...	...	...	...	...	17.20
St-Brice ...	... „	...		16.40					...	...		...	17. 0							...	...	...	...	17.20	
Sarcelles ...	... „	16.39							...	...		16.59								...	...	...	17.19		
Pierrefitte ...	... „	...							...	...	16.58	...								...	...	17.18	...		
Stains	... „	...							...	16.57	...	...								...	17.17	...	...		
St-Denis ...	... „	...							16.56	...	...	...								17.16	...	...	...		
Paris	... *arr.*	16.50	16.50	16.52	16.54	16.56	16.58	17. 0	17. 4	17. 6	17. 8	17.10	17.12	17.14	17.10	17.16	17.18	17.20	17.20	17.24	17.26	17.28	17.30	17.32	17.34
Platform	... ...	11	OS	10	9	12	11	10	12	11	10	9	12	11	OS	10	9	12	OS	10	9	12	11	10	9

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains Train No ... ... Platform		75 11		76 10	86 9	78 12	82 11	77 10	89 12	80 11	81 10	72 9	83 12	73 11	60 OS	87 10	79 9	88 12		77 10	82 9	78 12	86 11	76 10	75 9
Paris	... *dép.*	16.56	...	16.58	17. 0	17. 2	17. 4	17. 6	17.10	17.12	17.14	17.16	17.18	17.20	17.20	17.22	17.24	17.26	...	17.30	17.32	17.34	17.36	17.38	17.40
St-Denis ...	... *arr.*		...		...	...	...	17.14						...		...	...	17.34	...						...
Stains	... „		...		...	...	17.14	...						...		...	17.34	...	...						...
Pierrefitte ...	... „		...		...	17.13	...	...						...		17.33	...	...	...						...
Sarcelles ...	... „		...		17.12	...	...	...						17.32		...	...	...	...						17.52
St-Brice ...	... „		...	17.11	...	...	...	...					17.31	...		...	...	...	...					17.51	...
Ecouen	... „	17.11	...	...	...	...	...	...				17.31	...	...		...	...	...	...				17.51	...	...
Attainville ...	... „	...	...	...	...	...	...	...			17.31	...	...	...		...	...	...	...			17.51	...	...	...
Maffliers ...	... „	...	...	...	...	...	...	...		17.31	...	...	...	...		...	...	...	...		17.51	...	...	...	...
Courcelles ...	... „	...	...	...	...	...	...	...	17.31	...	...	...	...	...		...	...	...	...	17.51	...	...	...	...	...
Beaumont-Persan	... „	...	...	...	...	...	...	...	...	...	...	...	...	...	17.40	...	...	...	...	...	...	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains Train No.		74	85	84	61	88	79	87		73	53	83	72	81	80	89	R M		84	85	74	75	60	76	86
Beaumont-Persan ...	dép.	...	...	...	17.20	...	...	...	...	...	17.30	...	...	...	...	...	17.40	...	...	...	...	...	17.50	...	...
Courcelles	„	...	...	17.20		...	...	...	...	...		...	...	...	...	17.40	17.45	...	...	...	...	...		...	...
Maffliers	„	...	17.20			...	...	...	...	...		...	...	...	17.40		17.50	...	...	...	...	...		...	...
Attainville	„	17.20				...	...	...	...	...		...	...	17.40			17.54	...	...	...	...	...		...	...
Ecouen	„					...	...	...	...	...		...	17.40				**17.58**	...	...	...	...	...		...	18. 0
St-Brice	„					...	...	...	...	...		17.40					...	...	...	...	...	...		18. 0	
Sarcelles	„					...	...	...	...	17.39							...	...	...	...	...	17.59			
Pierrefitte	„					...	...	17.38	...	...							...	...	...	...	17.58	...			
Stains	„					...	17.37	...	...	...							...	...	...	17.57	...	...			
St-Denis	„					17.36	...	...	...	...							...	...	17.56	...	...	...			
Paris	arr.	17.36	17.38	17.40	17.40	17.44	17.46	17.48	...	17.50	17,50	17.52	17.54	17.56	17.58	18. 0	...	...	18. 4	18. 6	18. 8	18.10	18.10	18.12	18.14
Platform		12	11	10	OS	12	11	10		9	OS	12	11	10	9	12			10	9	12	11	OS	10	9

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains Train No. ... ... Platform		74 12	85 11	84 10	...	88 12	79 11	87 10	61 OS	73 9		83 12	72 11	81 10	80 9	89 12		R M	84 10	85 9	74 12	75 11		76 10	86 9
Paris	dep.	17.42	17.44	17.46	...	17.50	17.52	17.54	17.55	17.56	...	17.58	18. 0	18. 2	18. 4	18. 6	...	...	18.10	18.12	18.14	18.16	...	18.18	18.20
St-Denis	arr.	...	...	17.54	...						...		...	...	...	18.14	...	...					...		...
Stains	„	...	17.54	...	...						...		...	...	18.14	...	...	...					...		...
Pierrefitte	„	17.53	...	...	...						...		...	18.13	..	...	...	...					...		...
Sarcelles	„	...	...	...	...						...		18.12	...	...	...	...	...					...		18.32
St-Brice	„	...	...	...	...						...	18.11	..	...	...	...	...	...					...	18.31	...
Ecouen	„	...	...	...	...					18.11	...	...	...	...	...	...	...	18.12				18.31	...	...	...
Attainville	„	...	...	...	...			18.11		...	...	...	...	...	...	...	...	18.16			18.31	...	...	...	...
Maffliers	„	...	...	...	...		18.11	...		...	...	...	...	...	...	...	...	18.20		18.31	...	...	...	...	...
Courcelles	„	...	...	...	...	18.11	...	...		...	...	...	...	...	...	...	...	18.25	18.31	...	...	...	...	...	...
Beaumont-Persan ...	„	...	...	...	...	...	...	...	18.15	...	...	...	...	...	...	...	...	18.30	...	...	...	...	...	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8 **R. M.**—Rail Motor.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains Train No.		78	82		77	64	89	80	81	72	83	73	87	79	88	77	61	82	78	86	63	76		75	74
Beaumont-Persan	... *dép.*	...	...	...	...	18. 0	...	...	...	...	...	...	...	...	...	...	18.25	...	...	...	18.30	...	...	...	...
Courcelles ...	... ,,	...	...	...	18. 0		...	...	...	...	...	...	...	...	18.20	...		...	...	...		...	...	...	...
Maffliers ...	... ,,	...	18. 0	...			...	...	...	...	...	...	...	18.20		...		...	...	...		...	...	...	...
Attainville ...	... ,,	18. 0		...			...	...	...	...	...	...	18.20			...		...	...	...		...	...	...	18.40
Ecouen	... ,,			...			...	...	...	...	...	18.20				...		...	...	...		...	...	18.40	
St-Brice ...	... ,,			...			...	...	...	...	18.20					...		...	...	...		18.40	...		
Sarcelles ...	... ,,			...			...	...	...	18.19						...		...	...	18.39			...		
Pierrefitte ...	... ,,			...			...	...	18.18	...						...		...	18.38	...			...		
Stains	... ,,			...			...	18.17	...	...						...		18.37	...	...			...		
St-Denis ...	... ,,			...			18.16	...	...	...						18.36		...	...	...			...		
Paris	... *arr.*	18.16	18.18	...	18.20	18.20	18.24	18.26	18.28	18.30	18.32	18.34	18.36	18.38	18.40	18.44	18.45	18.46	18.48	18.50	18.50	18.52	...	18.54	18.56
Platform		12	11		10	OS	12	11	10	9	12	11	10	9	12	10	OS	9	12	11	OS	10		9	12

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains Train No: ... ... Platform		78 12	82 11	60 OS	77 10		89 12	80 11	81 10	72 9	83 12	73 11	87 10	79 9	88 12	77 10		82 9	78 12	86 11		76 10	61 OS	75 9	74 12
Paris	... *dép.*	18.22	18.24	18.25	18.26	...	18.30	18.32	18.34	18.36	18.38	18.40	18.42	18.44	18.46	18.50	...	18.52	18.54	18.56	...	18.58	19. 0	19. 0	19. 2
St-Denis ...	... *arr.*	...	...		18.34	...						...	...	...	18.54		...				...			...	...
Stains ...	... ,,	...	18.34		...	...						...	...	18.54	...		...				...			...	...
Pierrefitte ...	... ,,	18.33	...		...	...						...	18.53	...	...		...				...			...	19.13
Sarcelles ...	... ,,	...	...		...	...						18.52	...	...	...		...				...			19.12	...
St-Brice ...	... ,,	...	...		...	...					18.51	...	...	...	...		...				...	19.11		...	...
Ecouen	... ,,	...	...		...	...				18.51	...	...	...	...	...		...			19.11	...	...		...	...
Attainville ...	... ,,	...	...		...	...			18.51	...	...	...	...	...	...		...		19.11	...	...	...		...	...
Maffliers ...	... ,,	...	...		...	...		18.51	...	...	...	...	...	...	...		...	19.11	...	...	...	...		...	...
Courcelles ...	... ,,	...	...		...	...	18.51	...	...	...	...	...	...	...	...	19.11	...	...	...	...	...	...		...	...
Beaumont-Persan	... ,,	...	...	18.45	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	19.20	...	...

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

UP TRAINS TRAIN No.		85	84	88	79	87		73	83	72	81	80	89	55	84	85	74	75	76	86	59	78	82	
Beaumont-Persan	... dép.	...	...	...	...	...	...	...	...	...	...	...	...	19. 0	...	...	...	...	...	...	19.15	...	...	...
Courcelles ...	... ,,	...	18.40	...	...	...	...	...	...	...	...	...	19. 0		...	...	...	...	...	...		...	...	...
Maffliers ...	... ,,	18.40		...	...	...	...	...	...	...	...	19. 0			...	...	...	...	...	...		...	19.20	...
Attainville ...	... ,,			...	...	...	...	...	...	...	19. 0				...	...	...	...	...	...		19.20		...
Ecouen	... ,,			...	...	...	...	...	...	19. 0					...	...	...	...	...	19.20				...
St-Brice ...	... ,,			...	...	...	...	...	19. 0						...	...	...	...	19.20					...
Sarcelles ...	... ,,			...	...	...	...	18.59							...	...	...	19.19						...
Pierrefitte ...	... ,,			...	...	18.58	...	...							...	...	19.18	...						...
Stains	... ,,			...	18.57	...	...	...							...	19.17	...	...						...
St-Denis ...	... ,,			18.56	...	...	...	...							19.16	...	...	...						...
Paris	... arr.	18.58	19. 0	19. 4	19. 6	19. 8	...	19.10	19.12	19.14	19.16	19.18	19.20	19.20	19.24	19.26	19.28	19.30	19.32	19.34	19.35	19.36	19.38	...
PLATFORM		11	10	12	11	10		9	12	11	10	9	12	OS	10	9	12	11	10	9	OS	12	11	

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

DOWN TRAINS TRAIN No. ... ... PLATFORM		85 11	84 10	88 12	79 11	87 10	63 OS	73 9	83 12	72 11	81 10	80 9	89 12		84 10	85 9	74 12	75 11	76 10	86 9		78 12	82 11	55 OS
Paris	... dép.	19. 4	19. 6	19.10	19.12	19.14	19.15	19.16	19.18	19.20	19.22	19.24	19.26	...	19.30	19.32	19.34	19.36	19.38	19.40	...	19.42	19.44	19.45
St-Denis ...	... arr.	...	19.14							...	...	...	19.34	...						...	...	...	...	
Stains	... ,,	19.14	...							...	...	19.34	...	...						...	...	...	19.54	
Pierrefitte ...	... ,,	...	...							...	19.33	...	...	...						...	...	19.53	...	
Sarcelles ...	... ,,	...	...							19.32	19.36	...	...	...						19.52	...	...	...	
St-Brice ...	... ,,	...	...						19.31	...	19.38	...	...	...					19.51	...	...	...	...	
Ecouen	... ,,	...	...					19.31	...	...	19.42	...	...	...				19.51	19.55	...	...	...	...	
Attainville ...	... ,,	...	...			19.31		...	...	...	...	...	...	...			19.51	...	...	...	...	...	...	
Maffliers ...	... ,,	...	...		19.31	...		...	...	...	...	...	...	...		19.51	...	...	...	...	...	...	...	
Courcelles ...	... ,,	...	...	19.31	...	...		...	...	...	...	...	...	...	19.51	19.56	...	...	...	...	...	...	...	
Beaumont-Persan	... ,,	...	...	19.36	...	...	19.35	...	...	...	...	...	...	...	19.56	20. 1	...	20. 3	...	...	...	...	...	20. 5

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No.	77	90	50	87		88	62	73		84	52	51	76		85	44	75		90	65	88	67	
Beaumont-Persan ... *dép.*	...	19.20	19.30	...	...	19.40	20. 0	...	...	20. 5	20.15	20.30	...	...	20.35	20.42	20.48		20.52	21. 0	21. 5	21.15	...
Courcelles ... ... ,,	19.20	↓	↓	...	...	19.45	↓	...	...	20.10	↓	↓	...	...	20.40	↓	...	...	20.57	↓	21.10	↓	...
Maffliers ... ... ,,	↓	↓	↓	...	...	19.50	↓	...	...	20.15	↓	↓	...	...	20.45	↓	...	...	21. 2	↓	21.15	↓	...
Attainville ... ... ,,	↓	↓	↓	19.34	...	19.54	↓	...	...	20.19	↓	↓	...	...	20.49	↓	...	...	21. 6	↓	21.19	↓	...
Ecouen ... ... ,,	↓	↓	↓	19.38	...	19.58	↓	20. 0	...	20.23	↓	↓	20.30	...	20.53	↓	21. 0	...	21.10	↓	21.23	↓	...
St-Brice ... ... ,,	↓	↓	↓	19.41	...	↓	↓	20. 3	...	↓	↓	↓	20.33	...	↓	↓	21. 3	...	21.13	↓	↓	↓	...
Sarcelles ... ... ,,	↓	↓	↓	19.43	...	↓	↓	20. 5	...	↓	↓	↓	20.35	...	↓	↓	21. 5	...	21.15	↓	↓	↓	...
Pierrefitte ... ... ,,	↓	19.36	↓	...	...	↓	↓	20. 8	...	↓	↓	↓	20.38	...	↓	↓	21. 8	...	21.18	↓	↓	↓	...
Stains ... ... ,,	↓	19.39	↓	...	...	↓	↓	20.11	...	↓	↓	↓	20.41	...	↓	↓	21.11	...	21.21	↓	↓	↓	...
St-Denis ... ... ,,	↓	19.42	↓	...	...	↓	↓	20.14	...	↓	↓	↓	20.44	...	↓	↓	21.14	...	21.24	↓	↓	↓	...
Paris ... ... *arr.*	19.40	19.50	19.50	19.54	...	20.12	20.20	20.22	...	20.37	20.35	20.50	20.52	...	21. 7	21. 0	21.22	...	21.32	21.20	21.37	21.35	...
Platform	10	9	OS	12		11	OS	10		9	OS	OS	12		11	OS	10		9	OS	12	OS	...

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform	77 10	90 9		87 12	54 OS	88 11		73 10	50 OS	84 9			76 12	52 OS	85 11		75 10	51 OS	90 9		88 12		59 OS
Paris ... ... *dép.*	19.46	19.55	...	20.10	20.15	20.25	...	20.40	20.45	20.55	...	...	21.10	21.15	21.25	...	21.40	21.45	21.55	...	22.10	...	22.15
St-Denis ... ... *arr.*	19.54	↓	...	20.18	↓	↓	...	20.48	↓	↓	...	...	21.18	↓	↓	...	21.48	↓	↓	...	22.18	...	↓
Stains ... ... ,,	...	↓	...	20.21	↓	↓	...	20.51	↓	↓	...	...	21.21	↓	↓	...	21.51	↓	↓	...	22.21	...	↓
Pierrefitte ... ... ,,	...	↓	...	20.24	↓	↓	...	20.54	↓	↓	...	...	21.24	↓	↓	...	21,54	↓	↓	...	22.24	...	↓
Sarcelles ... ... ,,	...	↓	...	20.27	↓	↓	...	20.57	↓	↓	...	...	21.27	↓	↓	...	21.57	↓	↓	...	22.27	...	↓
St-Brice ... ... ,,	...	↓	...	20.29	↓	↓	...	20.59	↓	↓	...	...	21.29	↓	↓	...	21.59	↓	↓	...	22.29	...	↓
Ecouen ... ... ,,	...	20. 9	...	20.33	↓	20.39	...	21. 3	↓	21. 9	...	...	21.33	↓	21.39	...	22. 3	↓	22 9	...	22.33	...	↓
Attainville ... ... ,,	...	20.13	...	...	↓	20.43	...	...	↓	21.13	...	...	...	↓	21.43	...	...	↓	22.13	...	...	...	↓
Maffliers ... ... ,,	...	20.17	...	...	↓	20.47	...	...	↓	21.17	...	...	...	↓	21.47	...	...	↓	22.17	...	...	...	↓
Courcelles ... ... ,,	...	20.22	...	...	↓	20.52	...	...	↓	21.22	...	...	...	↓	21.52	...	...	↓	22.22	...	...	...	↓
Beaumont-Persan ... ,,	...	20.27	...	...	20.35	20.57	...	...	21. 5	21.27	...	...	...	21.35	21.57	...	22.14	22. 5	22.27	...	...	...	22 35

O.S.—Outer Suburban Platforms, Nos. 5–8.

11. BEAUMONT-PERSAN, ECOUEN ET PARIS—*continued.*

Up Trains / Train No.		64	87	84		63	73	85	45		76	75		90	54	88		87	84	55	73	85	66	67
Beaumont-Persan	... *dép.*	21.30	...	21.35	...	22. 0	...	22. 5	22.22	...	...	22.24	...	22.35	23. 0	...	...	23. 5	...	23.35	23.38	...	0.55	1.25
Courcelles ...	... ,,	↓	...	21.40	...	↓	...	22.10	↓	...	...	...	...	22.40	↓	...	...	23.10	...	↓	23.43	...	↓	↓
Maffliers ...	... ,,		...	21.45	...		...	22.15		...	...	22.32	...	22.45		...	...	23.15	...		23.48	...		
Attainville ...	... ,,		...	21.49	...		...	22.19		...	...	...	...	22.49		...	...	23.19	...		23.52	...		
Ecouen	... ,,		21.30	21.53	...		22. 0	22.23		...	22.30	22.40	...	22.53		23. 0	...	23.23	23.30		23.56	0. 0		
St-Brice ...	... ,,		21.33	↓	...		22. 3	↓		...	22.33	22.43	...	↓		23. 3	...	↓	23.33		↓	0. 3		
Sarcelles ...	... ,,		21.35		...		22. 5			...	22.35	22.45	...			23. 5	...		23.35			0. 5		
Pierrefitte ...	... ,,		21.38		...		22. 8			...	22.38	22.48	...			23. 8	...		23.38			0. 8		
Stains	... ,,		21.41		...		22.11			...	22.41	22.51	...			23.11	...		23.41			0.11		
St-Denis ...	... ,,		21.44		...		22.14			...	22.44	22.54	...			23.14	...		23.44			0.14		
Paris	... *arr.*	21.50	21.52	22. 7	...	22.20	22.22	22.37	22.40	...	22.52	23. 2	...	23. 7	23.20	23.22	...	23.37	23.52	23.55	0.10	0.22	1.15	1.45
Platform ...	...	OS	11	10		OS	9	12	OS		11	10		9	OS	12		11	10	OS	9	12	OS	OS

12. PARIS, ECOUEN ET BEAUMONT-PERSAN—*continued.*

Down Trains / Train No. ... ... / Platform			87 11	84 10	67 OS		73 9	85 12		56 OS	76 11	75 10	54 OS	90 9		88 12	55 OS	87 11	84 10					
Paris	... *dép.*	...	22.25	22.40	22.45	...	22.55	23.10	...	23.15	23.25	23.40	23.45	23.55	...	0.10	0.15	0.25	0.40	...	...	...	...	...
St-Denis ...	... *arr.*	...	↓	22.48	↓	...	↓	23.18	...	↓	↓	23.48	↓	↓	...	0.18	↓	↓	0.48	...	...	...	...	...
Stains	... ,,	...		22.51		...		23.21	...			23.51			...	0.21			0.51	...	...	...	...	...
Pierrefitte ...	... ,,	...		22.54		...		23.24	...			23.54			...	0.24			0.54	...	...	...	...	...
Sarcelles ...	... ,,	...		22.57		...		23.27	...			23.57			...	0.27			0.57	...	...	...	...	...
St-Brice ...	... ,,	...		22.59		...		23.29	...			23.59			...	0.29			0.59	...	...	...	...	...
Ecouen	... ,,	...	22.39	23. 3		...	23. 9	23.33	...		23.39	0. 3		0. 9	...	0.33		0.39	1. 3	...	...	...	...	...
Attainville ...	... ,,	...	22.43	...		...	23.13	...	...		23.43	...		0.13	...	...		0.43	...	...	...	...	...	...
Maffliers ...	... ,,	...	22.47	...		...	23.17	...	...		23.47	...		0.17	...	...		0.47	...	...	...	...	...	...
Courcelles ...	... ,,	...	22.52	...		...	23.22	...	...		23.52	...		0.22	...	...		0.52	...	...	...	...	...	...
Beaumont-Persan	... ,,		22.57	...	23. 5	...	23.27	...	...	23.35	23.57	...	0 5	0.27	...	...	0.35	0.57	...	...	...	...	...	...

O.S.—Outer Surburban Platforms, Nos. 5–8.

APPENDIX VIII

MAP.

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